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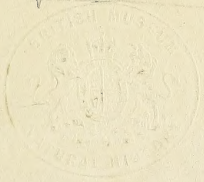

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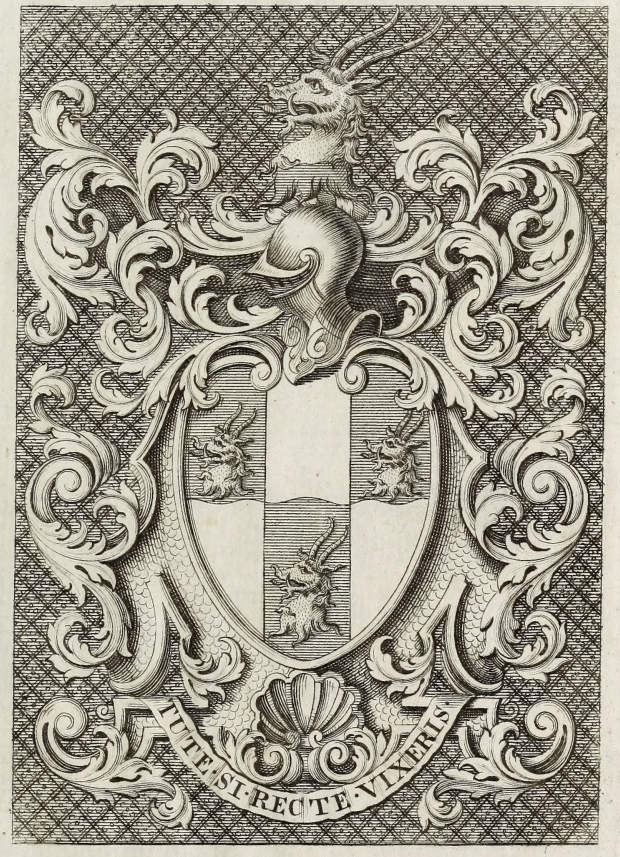
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BRITISH MUSEUM
NATURAL HISTORY

PHILOSOPHICAL Transactions:

GIVING SOME

ACCOMPT

OF THE

Present Undertakings, Studies and Labours

OF THE

INGENIOUS

IN MANY

Considerable Parts

OF THE

WORLD.

VOL. XI.

For the Year MDCLXXVI.

LONDON,

Printed by *T. R.* for *John Martyn*, Printer to the *Royal Society*; at the *Bell* in St. *Pauls Church-yard.*

Imprimatur,

March 1.
1676.
7.

JONAS MOORE, *Reg.S.Vice-Præs.*

TO THE
RIGHT HONOURABLE
ROBERT,
EARL of ALISBURY, &c.

My LORD,

EVER *since I have undertaken to publish the* Philosophical Transactions, *I have been concerned, once a year, to seek out a Noble Patron, to whose favour I might with good assurance address the Collections of the whole Year, when finished. And for this present Volume, I cannot devise better than to lay it before Your Lordship, who doth perfectly apprehend, How the* genius *of this Age hath countenanced the* Restauration of Noble Arts and of good Literature, *and that the* English Nobility *and* Gentry *have constantly shew'd a willingness to be the Example, (as it was first Illustrated and best Recommended by a Peer of* England, *the Lord Viscount of St.* Albans;) *and that great and deep Wits in all Forrain parts round about Us, and in many Remote places, do drive it on with no slow pace; the Emulation working high every where, and performing to admiration.*

This being so well known to Your Lordship, I am perswaded, It will be a divertizing Entertainment, to *take notice of the Yearly Growth of Philosophy, and of Philosophical Aids, in substance and in extent, with fresh supplies continually;* to *observe, that the Ingenuous do hold on in a Real Progress;* and to *remark, how, where, and by whom all Novel Inventions have their Rise, and by what Steps and Expedients they are promoted: Which is the best of Human helps, to excite, encourage and enable for other beneficial Inventions: And 'tis an ingenuous delight, to see the Virtuous advance with good Speed. The Philosophical Poet* Lucretius *said in his Rapture;*

lib. 2. Suave, mari magno, turbantibus æquora ventis,
E Terra magnum alterius spectare laborem!

The Poet esteems it a deep pleasure, to behold (as from a safe harbour on firm land) the deviations and collisions of profound and industrious Philosophers in all former Ages. And certainly it must be a more Natural and a more agreeable pleasure, and far greater happiness, to behold the fervent and sedulous Emulations of the most Civil and most Accomplished Nations (and of the acutest, the deepest, and the most learned amongst them,) contending with all their strength and skill, who shall excel the other in the most beneficial obligings of Mankind.

My LORD, I doubt, it will be expected, I should here represent to Your Lordships eye a hint of just applause for the great Merits of those Worthies, who have so happily brought-in their fresh supplies: But I must confine my self to a few soft Touches, which the most reserved Modesty may justly claim, and which Malice it self cannot deny.

Here-

Here then we have the accurate Observations of some judicious and learn'd Travellers: Excellent Instructions for generous Travellers. We have several Essays towards the Natural Histories of Countries, (which is the main drift of our humble suit at the beginning of this Volume;) of Mineral Waters; of some Animals, chiefly by Anatomical inspection. And the curious Anatome of Plants is here confirm'd, in some main Points, by good Microscopes. And we have here fair promises of improving Telescopes, which have already so much enlarged Astronomical knowledge; as the Microscope hath detected a great part of this habitable World, which hath been hitherto Invisible. And an Honourable Person of our Number, *hath given us a probable Account of the System of the World from the Superficial Figures of Fluids, and from contiguous Liquors. And he hath most convincingly discover'd the Origin and Mechanical deduction of Qualities; Substantially proving, that the famous Authors of Elder times did not throughly discern or consider the True processes of Nature in Generals. And the same hand puts a stop to the* Neoteric *Notions of Chymists, since they agree not with the verity of Experiments. The New Theory of Light and Colours is still maintain'd by Optical Experiments: And the flaming Tincture of Light strangely transmitted from Dead and unputrified flesh to Living Members merely by contact: And Luminousness more strangely impressed, for a time to reside in a factitious Body. The Mathematicks run on their course still, in fresh ground. Astronomy wants no encouragements, and hastens to perfection. Physick, Anatome, and Medicine, obtain New Discoveries; and after* Zwelfer, Schroder, *and many more ancient and famous Dispensatories, the Industrious* Charas *hath from much experience prepar'd an ample* Pharmaceutice. *And the Philosophers of* Germany *go on to increase their Curiosities.* Aristotle's *own Natural philosophy preferr'd before the Commentaries of Schoolmen; and the* Cartesian *before the* Aristotelian. *A* French *Water-Engin to quench Fires. Two Newly devised Hygroscopes. An Essay or endeavour to explain the Use of the Inclinatory Needle, for great Uses.*

My LORD, *I shall pass by other particulars, and conclude with that which is herein solicited as the main business of every good man; namely, to adorn his own Country with the best and most substantial Improvements. Of these,* Agriculture *is the surest, the most in our power, and the most fundamentally necessary of Domesticks; the Hortulane, best becoming the hands and care of the Generous: And Trade and Commerce do maintain the Multitudes, raise the value of Lands at home, and render us most considerable abroad. In both these respects, we have here given some Additional accounts: For the Mysteries and Intrigues of Trade, more than I have been able to dive into: And all* England *would rejoyce to see Trade reviv'd, and reaching all over the World: Which seems to be the honest design of the late Author of* Englands Improvement by Sea and Land.

My LORD, *I cannot doubt of your Lordships favourable Patronage in all concernments for the good of* England: *And since Your Lordships countenance contributes much to promote all our Affairs; this hath given me a confidence to make this address, and to entitle my self,* My Lord,

Your Lordships very humble and faithful Servant,

H. OLDENBURG.

Beginning the Eleventh Year.

PHILOSOPHICAL TRANSACTIONS.

March 25. 1676.

The CONTENTS.

The Preface to this Eleventh Year. A particular Answer of Mr. Isaac Newton *to Mr.* Linus *his Letter printed in Numb* 121, *about an Experiment relating to the New doctrine of Light and Colours. Extracts of three Letters of Signor* Cassini, *containing his sentiment of Mr.* Flamsted's *account of the last Eclipse of the Moon; as also his own Observations of that phænomenon; and likewise an observed Occultation of a Fixt Star by the Moon. Mr.* Flamsted's *Answer to the former three Letters; together with some Celestial Observations made by the same. An Account of some Books:* I. *ARCHIMEDES ARENARIUS, cum Notis & Versione D.* Johannis Wallis, *SS. Th. D. &c.* II. *Observationes Medicæ circa MORBORUM ACUTORUM HISTORIAM & CURATIONEM, Auth* Thoma Sydenham *M. D.* III. *De CONSENSU VET. & NOVÆ PHILOSOPHIÆ Libri* 4, *Auth.* J. B. du Hamel, *&c.* IV. *Of EDUCATION, especially of Young Gentlemen, &c.* V. *BATHONENSIUM & AQUISGRANENSIUM THERMARUM Comparatio, variis adjunctis illustrata à* R. P. VI. *VIRETUM BRITANNICUM, or a Treatise of Cider, and such other Wines and Drinks, as are extracted from all manner of Fruits growing in this Kingdom; with a Method of propagating all sorts of Vinous Fruit-trees, &c.*

The Preface.

IN this Preface to my Eleventh Volume, *which, under the Divine favour, I now begin, I shall only take notice of what seems to be most deficient, or most of all to retard the general growth of Physiological knowledge.*

And, I think, I may say, that a Natural Hiſtory of Countries *is moſt wanting; which, if well drawn, would afford us a copious view, and a delightful proſpect of the great variety of Soyls, Fountains, Rivers, Lakes, &c. in the ſeveral places of this globe; and of the manifold effects productions and operations of the Sun, and perhaps of other Celeſtial Influences upon them all; or of Subterraneal ſteams, or peculiar winds, ariſing at ſtate or uncertain times.*

To explain my Intentions, I would not here deny the praiſes juſtly due to many Ancient and Modern Geographers, Topographers, Hydrographers &c. and particularly to ſome late Travellers, who have made more accurate and faithful reports of the Countries where they have travelled, and more eſpecially where they have made ſome abode, than formerly was done. And ſeveral of theſe have diligently recorded, what conſiderable alterations have been made in ſome places by later Culture: Neither can we ſubduct from the applauſes of thoſe Learned and Inquiſitive Writers, who have ſearched deep into the Antiquities and Revolutions, which have hapned in the places they undertook to deſcribe: And we muſt acknowledg many excellent, ingenious and truly Philoſophical Hiſtories *of the Architecture, and grandeur, and ſituation of Royal and Noble Palaces, Cities, Cittadels, Fortifications, Towns, Bridges, Rivers, fertil Vales, Rocks and Mountains. But ſome of theſe have a Conſideration a part from Phyſiology, and do rather belong to Arts and Artifices: And ſome Writers are more concern'd for Panegyricks of the* amænities *of the place, than will well ſort with the true and modeſt relations of their Neighbours: As, when we read the beginning of the Ingenious* Barclay's Euphormio, *we are invited to prefer* Scotland *before any Paradiſe on Earth; which yet I do not blame or cenſure in that noble Romance: But in our deſigned* Natural Hiſtory *we have more need of ſevere, full and punctual Truth, than of Romances or Panegyricks.*

And it may deſerve another Conſideration apart, to record the Plagues, Epidemical Diſeaſes, Droughts and exceſſive or permanent Heats, extream or laſting Froſts, Famins, impetuous Storms, and Inundations, devouring ſwarms of Graſhoppers and Locuſts (of divers kinds of both which the famous Purchas *in his excellent Treatiſe of* Flying Inſects, ch. 31. *hath an Hiſtorical Collection,) and other annoyances of Mankind: Whether beginning and ending in one place, and of what continuance, as the Horſe-plague in our freſh memory continued about ſeven years in* England; *and the plague of* Athens

wandred

wandred far, and made cruel ſlaughters of Mankind, and of Birds and Beaſts alſo: And in the daies of Gallus *and* Voluſianus, *about the year* 250, *for fifteen years together, the Plague wandred from* Æthiopia *over all the remote Provinces; of which* Lipſius *ſaith* Nec alia unquam major lues mihi lecta, ſpatio Temporum, ſive Terrarum. *Sometimes theſe annoyances do coaſt it from place to place; ſometimes they rage at great diſtance of time and place, and ſometimes (contrary to old rules and common expectations,) horrid Winters are nearer the South, when in the more Northern Countries the Froſts are remiſs, or the Air gentle; and, on the contrary, deſtroying Heats and Droughts are in colder Climats, when they have more Refrigerating ſeaſons in the Sunny Climats; as in* Octob. An. 1112 *in* England, *the* Thames, Severn *and* Trent *were quite dried; and* An. 1474. *many Woods and Forreſts were fired with Solar heat, and the* Danube *in* Hungary *ſo near dried up, that men paſſed over on foot. Theſe inſtances ſeem to confirm thoſe Authors*, who maintain, that Fountains and Rivers have their Originals from Rain and Snow. Theſe few particulars of many hundreds I ſuggeſt on purpoſe, to ſhew, How much Mankind is concerned, and Nature diſcover'd, by ſuch Hiſtorical Collections; perhaps in time to find out the cauſes of ſome of theſe annoyances, and poſſibly to prevent them, or to deviſe remedies as Epidemically preſervative, as the maladies are Epidemically deſtructive. Of this kind of Literature I do not complain as neglected. Many excellent and induſtrious Chronologers have taken much pains in it.* Alſtedius *from thoſe, who wrote before him, drew down his Tables to the year* 1630: *And our* Jackſon *re-examined all that laboured in it before his daies; and 'tis believed, that he had good aſſiſtance from the Learned Biſhop of* Winchester *Dr.* Andrews. *And we are not without hopes, that as Learning grows on, the beſt Antiquaries will continue to correct and advance the* Emendation of Times, *with a ſpecial aſpect into Nature, Concomitants, and Circumſtances; which may be obtained, at good certainty, for many foregoing Ages, And for Celeſtial Revolutions, to the higheſt fame, the Tables may be recalculated for the fulleſt ſatisfaction Aſtronomically.*

* See *Numb* 119. of theſe Tracts.

The laſt Conſideration, which I ſhall here mention, aſpires to a very high flight of human Reaſon, as merely human, and ſearches into one of the greateſt depths of Nature, making the fulleſt diſcovery of Mankind, as Man is the Microcoſme, and Divinæ particula auræ; *namely*

to collect and digest in one series, and to bring us into Methodical Volumes, or under one view, the shapes, features, statures, and all outward appearances, and also the intrinsick mentals or intellectuals of Mankind. Of this, the latter part, concerning the Humors and propensions of the mind, is very elegantly and well done by the forenamed Barclay *in his* Icon Animorum, *as far as they were in his view, in the chief places of Europe, or as far as it agreed with his modesty to deliver a free and impartial judgment. And for this purpose, there are many fit parcels extracted out of the more ancient Historiographers by* Joh. Boemus Aubanus, *publisht about* 60 *years ago: The small Treatise is entituled,* Mores, Leges, Ritus omnium Gentium. *For externals,* Ligon *shews his excellent capacities and skill in painting, by describing the different shapes and features of* Indians *and* Negros, p. 54. *of his* Barbados. *The external difference seems easy for vulgar observation; the intrinsecals were intricate: Yet, without great subtlety, we may discern a vast difference between the neighbour Nations of* France, Spain, Italy, *and* Germany; *yea, between the People of the East and West, North and South in* England. *Now I conceive, there is as much difference between these characters, heaped up together promiscuously, and when they are sorted to their proper Climats, by longitudes and latitudes, for the detection of the nature of this Masterpiece, as the fairest, richest, and best order'd Gardens and Orchards are more beneficial, more beautifull, and give a more solid delight, than a painted Landskip of* Biscaye, *or some wild* Grotesco. *Yet this I propose also as a work apart for my present aim; but worthy of more supplyes, and future diligence, as knowledg advanceth.* Sueton. *hath drawn to life both the Portraictures and Insides of the XII* Cæsars; *and others have essay'd the like for the Princes, Eminent Persons, and Peoples of several Nations; so that we want not good Exemplars for the encouragement of this work.*

After these acknowledgments of the just merit of those excellent Authors, who have recovered the culture and improvements of their Countreys, or the artificial ornaments, Architectures and Ingenio's (such as may be referr'd to the Cabinets, copper Cuts and Engravery of Monsieur De Marolles, *as he is celebrated in Mr.* Evelyn's *elaborat Chalcography* p. 135, 136.) *and of those industrious Registers of the extraordinary occurrences in all Ages, which cannot be explicated for Physiological uses, but only by the Methods and Extracts of Chronology; and lastly of those curious and argute Historians that have illustrated the characters*

characters of Mankind under several Descriptions, in many Nations antient and modern: If I may now have leave to clear my present sense freely by instances, I humbly conceive, that we may see more of the nature of the Places in the learned Descriptions of many parts of America, *and of some Countreys remote, and thinly inhabited in the North, than in the Geography of our most richly cultivated and polite Neighbourhood of* France, Italy, Spain, Germany, &c. (*excepting always the culture, improvement, and artificial ornaments of those last nam'd places:*) *where yet there is no small number of able and curious Naturalists, and who have advanced far in describing many of the most considerable parts and productions of Nature; but have not hitherto reduced the whole & unmix'd process of Nature into a compleat body, either answerable to our modern progress in discovering other Physiological* Phænomena, *or to the instructions for such a Natural History of Countreys, as was timely given in* Numb. 11. *of these Tracts. Neither have we yet received satisfactory answers to some of the Inquiries publisht in our foregoing Volumes, which were intended to solicit a confirmation (after a severe examen) of such particulars as might seem to us strange, but were reported by Authors of good note.*

In pursuit of this design for England, *a Learn'd Doctor hath laid a good foundation in his* Pinax, *abbreviated* Num. 20. *Another worthy Person hath well examin'd, what* Vegetables *are native here or in the Islands about us, and recorded where they may be found. Several accompts are taken of the* Mineral *or Healing-Fountains of note amongst us, and more of late discover'd than formerly observ'd. And of* Mines *there are good Authors abroad. And from* Cornwal *we are told of the* Shelf *or* Fast-grounds, *which they conceive to have never been mov'd, how it differs from the moveable or mov'd parts of Earth,* Numb. 69. *And it were to be wished, that in all Mines and where ever deep wells are digged, notice were taken, in what order the several kinds of Earth, loam, sand, gravel, &c. do lye. For* Insects, *some have out-gone (by parcels) the accuratness of* Muffet, *and former Authors. And for* Fishes *that may be found in our Lakes and Rivers, we see a fuller catalogue than we could expect, in the 4th* Part *of the* Gentleman's Recreation. *And in* Muffet's Healths Improvement, *we have an elder list of the same, and of such Fish as may be taken in our Creeks and Seas, and how both sorts may be best order'd for our* English *diet. And the observations on the* Bills of Births and Mortality *are of manifold use in relation to life, and health, and our Epidemical infirmities, and also to our Politicals.*

And

And Mr. Boyle *discover'd and published the use of the* Baroscope, *to remark the weight of the* Atmosphære *and the changes of that weight in his first Treatise of Pneumaticals an.* $16\frac{52}{00}$; *that the* Mercury *ascended in* England *to* 30 *inches, and above* $\frac{1}{8}$, *Exper.* 17th; *that it changed within five weeks to full two inches, Exp.* 18th; *and the changes, in reference to heat, cold, wind, weather, and other alterations of the air, or whatever secret circumstances, have been remarked at* London, Oxford, *far in the West and other parts of* England, *these* 10 *years and upwards. The Weel-Barometer perfected,* Num. 13. *Another Statical* Baroscope *accuratly devised,* N. 14. *And many other Instruments contrived and Materials prepared, which may make a deeper and closer discovery of the nature of a Place, than hath formerly been observ'd. And besides what is done as proper for this Island, there was begun by Dr.* Ger. Boate, *and published an.* 1652. Ireland's Natural History, *which if the Author had lived to finish, had been much fuller; and 'tis hoped that others will soon give it a larger measure of perfection. So that, though we are in this 'address somewhat tardy, yet, I think, we are not much behind our neighbours. And some have also made considerable researches which extend far beyond these our Climats. But I must forbear. If I am prolix here, it may be considered, that this is a pregnant part of our main business in Physiology; and it may be interpreted for a good proof of no monopolizing envy of us, in that we are willing to provoke our Neighbors to excel us in things that are truly good and excellent.*

A particular Answer of Mr. Isaak Newton *to Mr.* Linus *his Letter, printed in* Numb. 121. p. 499. *about an Experiment relating to the New Doctrine of Light and Colours: This Answer sent from Cambridge in a Letter to the Publisher Febr.* 29. $167\frac{5}{6}$.

Sir,

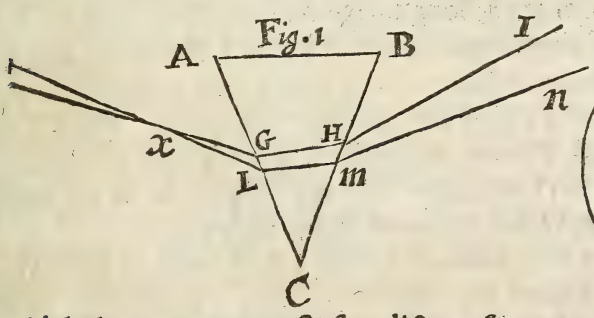
BY reading Mr. *Linus*'s Letter when you shew'd it to me at *London*, I retained only a general remembrance, that Mr. *Linus* deny'd what I affirmed, and so could lately say nothing in particular to it; but having the opportunity to read it again in *Numb.* 121. of the *Transactions*, I perceive he would perswade you, that the information you gave him about the Experiment is as inconsistent with my printed Letters as with experience; and therefore, lest any who have not read those Letters should take my silence in this point for an acknowledgment, I thought it not amiss, to send you something in answer to this also.

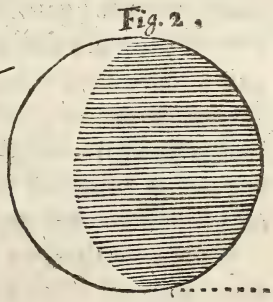
He

He tells you that, *Whereas you assure him, First, that the Experiment was made in clear days; secondly, that the Prism was placed close to the hole, so that the light had no room to diverge; and thirdly, that the Image was not parallel but transverse to the axis of the Prism: If these Assertions be compared with my Relation of the Experiment in the Phil. Transaction N.* 80. *p.* 3076. *it will evidently appear, they cannot be admitted as being directly contrary to what is there delivered.* His reasons are these:

First, that I said, *the ends of the long Image seemed semicircular, which,* saies he, *never happens in any of the three cases above said.* But this is not to set me at odds with my self, but with the experiment; for it is there described to happen in them all; and I still say, it doth happen in them. Let others try the Experiment, and judge.

Further he saies, that *the Prism is placed at a distance from the hole in the Scheme of the Experiment in* N. 84. p 4091. But, what if it were so *there?* For, that is the Scheme of a *demonstration*, not of the *experiment*, and would have served for the demonstration, had the distance been put twenty times greater than it is. In the Schemes of the Experiment *N.* 80. *p.* 3086, and *N.* 82. *p.* 5016. it is represented close, and close enough in the Scheme, *N.* 83. *p.* 4061: But Mr. *Linus* thought fit to wink at these, and pitch upon the Scheme of a Demonstration, and such a Scheme too as hath no hole at all represented in it. For, the Scheme † *Numb.* 84. *p.* 491 is this; † *See Fig.*





in which the rays are not so far distant from one another at *GL*, but that the hole, had I expresst it, might have been put there, and yet have comprehended them. But if we should put the hole at *x*, their decussation; yet will it not be any thing to his purpose; the distance *x G* or *x L* being but about half the breadth of a side of the Prism ($\frac{1}{2}$AC) which I conceive is not the twentieth part of the distance requisite in his conjecture.

O

$\frac{24}{4.49}$

Thirdly,

3. He says, that *more might be said out of my relation to shew, that the Image was not transvers, for if it had been transvers, I could not have been surprized (as I said I was) to see the length thereof so much exceed the breadth, it being a thing so obvious & easie to be explicated by the ordinary rules of Refraction.* But on the contrary, it may rather be said, that if the Image had been parallel, I could not have been surprized to see the length thereof so much exceed the breadth, it being a thing so extreamly obvious as not to need any explication. For who that had but common sense, and saw the whole Prism or a good part of it illuminated, could not expect the light should have the same long figure upon the wall that it had when it came out of the Prism? Mr. *Linus* therefore, while he would strengthen his argument by representing me well skilled in Opticks, does but overthrow it. But whereas he sayes, *I could not have been surprized at the length, had the Image been parallel, it being a thing so obvious and easy to be explicated by the ordinary rules of refraction:* Let any Man take the Experiment intire as I have there delivered it, that is, with this condition, that *the refractions on both sides the Prism were equal*, and try if he can reconcile it with the ordinary rules of refraction. On the contrary, he may find the impossibility of such a reconciliation, demonstrated in my Answer to *P. Pardies N.* 84, *p.* 4091.

In the last place, he objects, that my saying in *N.* 80. *p.* 3077, *that the incident refractions were in the Experiment equal to the emergent*, proves again, that the long Image was parallel. And yet that very saying is a sufficient argument, that I meant the contrary, because it becomes wholly impertinent, if apply'd to a parallel image; but in the other case is a very necessary circumstance. What is added therefore of *P. Pardies*, might have been spared; especially since that Learned Person understood my discourse to be meant of a transvers Image, and acquiesced in my Answers.

This in answer to Mr. *Linus*'s Letter: And now to take away the like suspicions from his Friends, if my declaration of my meaning satisfie not, I shall note some further passages in my Letters, whereby they may see, how I was to be understood from the beginning, as to the aforesaid three circumstances.

For the *Day*; I express every where that the Experiment was tried in the Sun's light, and in *N.* 80. *p.* 3077, that the breadth of the Image by measure answered to the Sun's diameter: But because it is pretended, I was imposed upon, I would ask, what the Experiment as it is advanced to that which I called the *Experimen-*

tum

tum Crucis, can have to do with a cloudy day? For, if the *Experimentum Crucis* (which is that which I depend on) can have nothing to do with a cloudy day, then is it to no purpose to talk of a cloudy day in the first Experiment, which does but lead on to that. But if this satisfie not, let the *Transactions N.* 83. *p.* 4060, be consulted: For. there I tell you, how *by* applying a *Lens* to the Prism, the streight edges of the oblong Image became distincter than they would have been *without* the *Lens*: A circumstance which cannot happen in Mr. *Linus*'s case of a bright Cloud.

For the *Position of the Prism*; I tell you *N.* 80. *p.* 3076, that it was placed *at the Sun's entrance* into the Chamber, and in *p.* 3085. I bad to make a hole in the shut, and *there* place the Prism, and in the next page I say again, that the Prism ABC is to be set *close* by the hole F of the window EG; and accordingly represent it close in the Figure. Also in *pag.* 3077 I tell you, that the distance of the *Image* from the *hole* or *prism* was 22 foot; which is as much as to say, that the Prism (suppose that side of it next the hole) was as far from the Image as the hole it self was, and consequently that the Prism and Hole were contiguous. Also in *p.* 3078, where instead of the Window shut I made use of a hole in a loose board, I tell you expresly, that I placed the board *close* behind the Prism. All these passages are in my very first Letter about Colours; and who therefore would imagine, that any one that had read that Letter should so much as suspect, that I placed the Prism, I say not at so great a distance as Mr. *Linus* supposes, but at any distance worth considering?

Lastly, for the *Position of the Image*, it is represented transvers to the axis of the Prism in the figures *N.* 80. *p.* 3086. *N.* 83. *p.* 4061, and *N.* 85. *p.* 5016. And in *N.* 88. *p.* 5093, where I made use of two cross Prisms, I tell you expresly, that the Image was cross to both of them at an angle of 45 degrees. The calculations also *N.* 80. *p.* 3077. are not to be understood without supposing the Image cross. Nor are my notions about different Refrangibility otherwise intelligible: For in Mr. *Linus*'s supposition, the rays that go to the two ends of the Image, are equally refracted. So for colours, the *red*, according to my description, falls at one end of the Image, and the *blew* at the other; which cannot happen but in a transvers Image. The same position is also demonstrable from what I said in *N.* 80. *p.* 3076, about turning the long Image into a round one, by the

contrary refraction of a second Prism, further explained in *Num.* 83. *p.* 4061. For this is not to be done in Mr. *Linus* surmise of a parallel Image, and therefore had Mr. *Linus* considered it, he could never have run into that surmise.

This I suppose is enough to manifest the three particulars; any one of which being evidenced, is sufficient to take away the scruple. And therefore Mr. *Linus* Friends need not fear but that the further directions I sent them lately for trying the Experiment are the same with those I have follow'd from the beginning; nor trouble themselves about any thing but to try the Experiment right. But yet, because Mr. *Gascoin* has been pleased to insinuate his suspicion that I do differ from himself in those directions, I shall not scruple here to reduce them into particulars, and shew where each particular is to be found.

1. Then, he is to get a Prism with an angle about 60 or 65 degrees, *N.* 80. *p.* 3077, and *p.* 3086. If the angle be about 63 degrees, as that was which I made use of *N.* 80. *p.* 3077, he will find all things succeed exactly as I described them there. But if it be bigger or less, as 30, 40, 50, or 70 degrees, the Refraction will be accordingly bigger or less, and consequently the Image longer or shorter. If his Prism be pretty nearly equilateral (such as I suppose are usually sold in other places as well as in *England*) he may make use of the biggest angle. But he must be sure to place the Prism so, that the Refraction be made by the two planes which comprehend this angle. I could almost suspect, by considering some circumstances in Mr. *Linus*'s Letter, that his error was in this point, he expecting the Image should become as long by a little refraction as by a great one; which yet being too gross an error to be suspected of any Optician, I say nothing of it, but only hint this to Mr. *Gascoin*, that he may examine all things.

2. Having such a Prism, he must place it so, that its Axis be perpendicular to the rays *N.* 84, *p.* 4091, *lin.* 18, 19. A little error in this point makes no sensible variation of the effect.

3. The Prism must be so placed, that the Refractions on both sides be equal *N.* 80, *p.* 3077: which how it was to be readily done by turning it about its Axis, and staying it when you see the Image rest between too contrary motions, as I explained in my late Descriptions, so I hinted before *N.* 80. *p.* 3077, *lin.* 34, 35, 36. If there should be a little error in this point also, it can do no hurt.

4. The

4. The Diameter of the hole I put $\frac{1}{4}$ of an inch *N.* 80, *p.* 3077, and placed the Prism close to it, even so close as to be contiguous, *N.* 80, *p.* 3077, *lin.* 4, 5. But yet there needs no curiosity in these circumstances. The hole may be of any other bigness, and the Prism at a distance from the hole, , provided things be so ordered, that the light appear of a round form, if intercepted perpendicularly at its coming out of the Prism. Nor needs there any curiosity in the *day*. The clearer it is the better; but if it be a little cloudy, that cannot much prejudice the Experiment, so the Sun do but shine distinctly through the cloud.

These things being thus ordered, if the refracted light fall perpendicularly on a wall or paper at 20 foot or more from the Prism, it will appear in an oblong form, cross to the axis of the Prism, *red* at one end, and *violet* at the other; the length five times the breadth (more or less according to the quantity of the refraction,) the sides, streight lines, parallel to one another, and the ends confused, but yet seeming semi-circular.

I hope therefore, Mr. *Linus*'s Friends will not entertain themselves any further about incongruous *surmises*, but try the Experiment as Mr. *Gascoin* has promised. And then, since Mr. *Gascoin* tells you, That *the Experiment being of it self extraordinary and surprizing, and besides ushering in new Principles into Opticks, quite contrary to the common and received, it will be hard to perswade it as a truth, till it be made so visible to all as it were a shame to deny it*: if he esteem it so extraordinary, he may have the priviledg of making it so visible to all, that it will be a shame to deny it. For, I dare say, after his testimony no body else will scruple it. And I make no question but he will hit of it, it being so plain and easy, that I am very much at a loss to imagine what way Mr. *Linus* took to miss. Dat. *Cambridge Feb.* 29. $167\frac{5}{6}$.

An Extract of a Latin Letter of Signor Cassini, *containing both his Considerations upon Mr.* Flamsteed's *account of the Lunar Eclipse of* Decemb. 21. 1675 †, *and his own Observations of the same Eclipse.*

† See *N.* 121. *p.* 495. of these Tracts.

Clarissimo Viro
Dom. *Henr. Oldenburg* Reg. Soc. à Secretis
J. Dominicus *Cassinus* S. P.

OBservatio Lunaris Eclipsis, nocte præcedente diem primam Januarii *anni hujus celebratæ, quam mihi à doctissimo* Flamstedio *communicasti, inter difficillimas recensenda est. Obliqua quippe Lunæ incidentia in Umbram, in hoc*

parvo Defectu tempora Appulſuum & Emerſionum tam Marginum quàm Macularum effecit incertiora, perplexoſque nonnihil in iis determinandis tenuit Obſervatores, cùm Umbra diu multumque eaſdem raderet maculas, tarduſque eſſet tranſitus à Penumbra denſiori ad totalem Umbram, minimè præciſis terminis cohærentem. Itaque Eclipſin hanc Meridianorum differentiis exactè determinandis prorsùs ineptam cenſuimus, cùm differentia temporum earundem phaſium, diverſis terræ locis notatorum, perplexitates involvat, quæ eodem in loco differentias exhibere ſenſibiles poſſunt.

Nos, quibus per totam Eclipſis durationem Cœli arriſit ſerenitas, cum DD. Richardo *&* Romero *ad Lunam ſimul diverſis Teleſcopiis intenti, communi conſenſu phaſes determinavimus, comparantes Umbram non modò d Maculas ad quas appellebat, ſed etiam ad plures ex maculis circumſtantibus, Umbræ ſitui determinando idoneis, ut ad æquidiſtantes ab Umbra, ad eas quæ caderent in recta linea cum cornibus, quorum diſtantiam opportunis temporibus cepimus: quod etiam video à præclaro* Flamſtedio *factum.*

Duo autem præcipua à nobis exactè determinata ſunt, Medium ſc. Eclipſis tempus, ejuſque Magnitudo. Medium deductum eſt non ſolùm ex comparatione Initii & Finis, ſed etiam duarum æqualium Phaſium, determinatu facillimarum, quando ſcil. diſtantia Cornuum æqualis erat Lunæ ſemidiametro, ante Eclipſin captæ, 15'.28" : Scilicet, cùm Initium *Eclipſis exiſtimatum fuerit* h.2.24'.35". *poſt mediam noctem; Finis verò totalis, relictâ penumbrâ ſimili ac fuerit in determinatione Initii,*

	$4^h.\ 15'.\ 25''.$
Duratio totius Eclipſis provenit	1. 50. 50.
Dimidia	0. 55. 25.
Et Eclipſis medium	3. 20. 0.
Sexta verò circumferentiæ pars abſciſſa eſt	2. 38. 5.
Atque iterum	4. 2. 25.
Intervallum	1. 24. 20.
Dimidium	42. 10.
Hinc Medium Eclipſis	3. 20. 15.

Intra quartam minuti partem priori determinationi conveniens.

Parùm abeſt quin etiam ex D. Flamſtedii *obſervationibus* Medium *Eclipſis pari modo eruatur. Is quippe*

*H.*14.29'.30". *diſtantiam cuſpidum obſervavit* 17'. 16". *Et*

*H.*15.52.45. *eclipſi decreſcente diſtantiam obſervavit* 18. 57, *uno ſcil. minuto* 41" *majorem: Itaque* Medium *eclipſis propius eſt poſteriori obſervationi quàm priori.*

Medium tempus inter utramque obſervationem fuit h.15.11'.7". *Tardius igitur aliquanto deducitur hinc Eclipſis* Medium; *unde differentia Meridianorum proveniret minor min.* 9; *quod minimè convenit obſervationibus certioribus Eclipſis præcedentis æſtivæ, ex quibus illam deduxi min.* $10'\frac{3}{4}$. *Prior obſervatio noſtra cum priore D.* Flamſtedii, *aliquanto tardiore, comparata, differentiam Meridianorum exhibet majorem* 8'. 35". *Poſterior noſtra, tardior obſervatione poſteriore D.* Flamſtedii, *differentiam Meridianorum exhiberet minorem* 9'.40".

Finis

	h.	′	″
*Finis à D.*Flamstedio *existimatus*	16.	7.	15.
Et à nobis	16.	15.	25.
Differentiam Meridianorum inferret		8.	10.
*Initium à D.*Halleio *Londini observatum*	14.	16.	
Cum observato à nobis	2.	24.	35.
Differentiam Meridianorum faceret		8.	35.

Ex hac igitur Eclipsi differentia Meridianorum erueretur duobus *circiter* minutis *minor, quàm ex Eclipsi æstatis præcedentis, quam tamen huic longè præferos, non solùm spectatâ Majori facilitate determinandi tempora Appulsuum & Emersionum in ea Eclipsi totali, quàm in hac partiali; verùm etiam ob aëris serenitatem, quâ utique æqualiter usi fuimus in* ea *Eclipsi; cum in* hac *Parisiis cœlum sereniſſimum, Londini fuerit subnubilum; quo nomine Parisienses observationes Londinensibus censeo præferendas. Differentia autem constitutionis Aeris efficit, ut Nos limbum Lunæ occidnum in Umbra* 12 *minutis ante determinatum à nobis Eclipsis finem videre potuerimus; cùm* Flamstedius *ipsum non nisi in fine videre potuerit.*

Cæterum in Situ umbræ & Eclipsis Magnitudine planè convenimus. Ab utrisque quippe nostrûm annotatum est, Umbram nunquam superasse Porphyridem, *licèt is altè in Penumbram fuerit immersus.* Porphyriti *proximus est* Mons parvus albicans, *quem tunc* Aristarchi comitem *appellavimus, eò quòd ab ipso seu* Porphyrite *vix distet sui diametro. Is monticulus immersus est in umbram* h.2.51′.15″; *emersit autem* h. 3.8′.25″, *totoque tempore interjecto fuit Umbra* Porphyriti *proxima.*

Uterque pariter annotavimus, in summa Eclipsi Umbram ad Corsicam *ferè pertigisse, nunquam tamen ab ea fuisse tectam, sed relictum exiguum intervallum, cujus termini distantia à Lunari margine proximè capta est* 8′.17″; *cùm* Flamstedius *Insulæ ipsius paulò remotioris distantiam ab eodem limbo invenerit* 8′. 39″. *Insulam quoque seu potius Peninsulam* Macram *utrique umbræ diutissimè adjacentem conspeximus; nos id fieri cæpisse notavimus* h.3.28′.15″, *& per horæ quadrantem in eadem distantia perseverasse.*

Hæc dum scribo, redditum mihi est cum humanissimis literis tuis Diarium Astronomicum *, *à vestris Astronomis supputatum; percommodum sanè, prævidendisque Observationum opportunitatibus perutile. Erit illud mihi semper præ oculis, meque ad Observationes quas annotat comparabo, easque Vobis vicissim communicabo. Vale, &c.* Parisiis *d.*11.Febr.1676.

* This is the *R. Almanick*, for the Year 1676, which was sent him from hence, for the sake of the Appulses, calculated, and annexed at the end thereof.

*Another Letter from the same to Mr.*Flamsteed, *upon the same Argument.*

Clarissimo Dom. *Joh. Flamstedio*, Astr. præclarissimo.

J. Dominicus *Cassinus* S. P.

COmmunicavit mihi Dom. Oldenburgius *Observationes tuas nuperæ Lunaris Eclipsis, quas in responsione ad ipsum cum nostris, in Regio Observatorio habitis, me comparasse dixi. Duorum vel trium minutorum discrimen*

inter

inter utrasque Observationes tribuo difficultati determinandi tempora Phasium in obliqua incidentia in Umbram penumbræ conterminam, differentiæque constitutionis Aeris, quem Tu sub-nubilum, Nos habuimus serenissimum. Ex hâc, Meridianorum differentia erueretur minor quàm ex Eclipsi præcedente, cui tamen standum censeo, donec per observationes Immersionum & Emersionum Satellitum Jovis, quos ad hanc rem existimo maximè idoneos, rem scrupulosius determinemus. Nec enim adhuc in tuam venire sententiam potui, qui, cùm de uno tantùm minuto quæstionem moveas, sequi videris methodum valdè compositam deducendi differentiam Meridiani Parisiensis *à* Londinensi *ex observationibus pluribus diversi generis, Occultationis nempe Fixæ à Luna,* Londini *&* Gedani *observatæ, & Eclipsis Solis observatæ* Parisiis *&* Gedani, *in quarum utraque Parallaxis ratio habenda est; eamque præferre videris Methodo simplici deducendi eandem differentiam ex plurium phasium ejusdem Eclipsis,* Londini *&* Parisiis *observatæ mirifico consensu.*

Majorem quoque differentiam Observationum provenire posse censeo ex difficultate distinguendi Umbram veram à Penumbra, quàm ex differentia Telescopiorum, trium quatuorve pedum longitudinem excedentium. Hæc enim Telescopia decimas Minutorum partes ritè distinguunt, nec per se variabunt indicium temporum Phasium earundem à maximis plus quintâ horarii minuti parte, cùm perplexitas termini Umbræ veræ unum & alterum minutum temporis quandoque suspensum teneat Observatorem. Nec verò perplexitas hæc magnitudine Telescopiorum imminuitur, quemadmodum Umbra remotissimi corporis hîc in terris non exactiùs distinguitur à Penumbra ab oculo illi proximo, quàm ad certam distantiam remoto. Quicquid de hac re sit, spero nos ex Observationibus Jovialium, *qui jam mane ritè conspiciuntur, differentiam Meridianorum exactiùs determinaturos. Vale, Vir Clarissime, &, ut cœpisti, rem Astronomicam promove. Dab.* Parisiis *d.* 11. Febr. 1676.

A Copy of a third Letter written by Signor Cassini, *touching an Occultation of a Fixt Star by the Moon; observ'd by the same.*

Clarissimo Viro

D. *Henrico Oldenburg* Reg. Societati in Secretis

J. Dom. *Cassinus* S. P.

OCcultationem Stellæ sequentis duarum in sinistro pede posteriori Leonis à Luna, quam D. Hamstedius *supputaverat, in Regio Observatorio cum D.*Romer *exactè observavi d.*29 Februarii.

Fuit Immersio horâ p.m. 10.19'.34". *Immersionis plaga fuit juxta finem* Schicardi *versùs* Phocilidem *in Selenographia Riccioli.*

Emersio verò fuit horâ 11.16'.40". *in æquali à recta distantia à* Vendelino *&* Petavio.

Per puncta Immersionis & Emersionis, diligenter notata, ducta recta linea diametrum illi perpendicularem abscidit in ratione 6'. 45". *ad* 26'. 5".

Fuit autem diameter Lunæ ad Meridianum accedentis 32'. 50".

*H.*12.29'. *margo Lunæ superior fuit in eodem parallelo cum Stella, quæ tunc præcedebat Lunam minuto horario* 1'.50".

H. 12.

H. 12.40'. 18". *Stella præcedebat marginem occidentalem Lunæ minutis horar.* 2'. 11". *Lunæ diameter pertranſibat* 2'.14".

H. 12.52'.35". *Stella præcedebat eundem marginem* 2'.25".

Altitudo Meridiana limbi inferioris Lunæ capta eſt gr. 39.25'.25".

Rumor hîc percrebuit, viſum Nanneti *Cometam valdè obſcurum inter* Eridanum & Leporem. *Nobis, ex quo cœli ſerenitas affulſit, fruſtra quæſitus eſt. Hac verò occaſione inter* Canem majorem & Navem *deprehendi* Nebuloſam *viſu pulcherrimam, ſi magnis Teleſcopiis inſpiciatur, ex Stellis confertiſſimis compoſitam, quæ cœlum mediat cum* Cane minori.

Inſpecta quoque mihi eſt Stella nova in ore Ceti, *quæ annos aliquot latuit, Solaribus radiis tempore maximæ fulſionis immerſa; nunc verò Stellas tertiæ magnitudinis facilè ſuperat.*

Obſervationibus etiam Mercurii, *qui nuper è Solaribus radiis emerſit, invigilamus; quod & Aſtronomos veſtros facturos putem. Vale, & has Obſervationes Dom.* Flamſtedio *noſtro, cum officii noſtri ſignificatione, impertire.* Pariſiis *d.*4.Martii 1676.

*Mr.*Flamſteeds *Anſwer to the former three Letters, containing alſo ſome celeſtial Obſervations.*

Viro clariſſimo
Domino Johanni Dominico Caſſino, Aſtron. Regio Pariſino.
Joh. Flamſtedius S. P.

LUnæ ad 33um Leonis *appulſum, ſereno ad votum aere tibi obſervare contigiſſe, valde lætor; quodque eum mihi communicare voluiſti, gratè habeo. Paratus eandem Occultationem præſtolabar; ſed nubes, cœlum undiquaque ferè eâ nocte hîc ſubtegentes, iſtac me felicitate privarunt. Optandum equidem, id utriſque noſtrûm pari tunc ſerenitate arriſiſſe; meliùs quippe ab eadem, accuratè obſervatâ, Meridianorum noſtrorum differentiam inveſtigare potuiſſemus, quàm vel ab Occultatione ultimæ* Geminorum, *Londini & Gedani in Eclipſi Lunæ* Januar. 1.1675. *notatâ, vel ab Eclipſibus Lunæ nuperis, quibus ad id negotiam hactenus uſi fuimus. Differentiæ enim, ab Ecclipſi Lunæ* Junii 27.1675. Londini & Pariſiis *obſervatâ, deductæ, vix fidere poſſum; quippè, licèt tempora phaſium à Vobis obſervatarum accuratiſſimè determinata credam;* Ego, *cùm amplior non ſuppeteret, Quadrante uſus fui* 20 *tantùm digitorum radio, ad horologium corrigendum, quique nuda duntaxat habuit pinnacidia; & propterea de momento phaſis alicujus certior eſſe vix potui quàm ad unum minutum horarium. Noviſſimam Eclipſin* Decemb. 22. *inſtructior obſervavi; cùm tamen mihi aer ſubnubilus extiterit, &, propter obliquam Lunæ in Umbram terræ incidentiam, tardiſſimus fuerit ejus ad Maculas appulſus, minùs apta fuit hæc Eclipſis huic negotio. De Occultatione ultimæ* Geminorum, *quam cum* Streetio *noſtrate* Edmund. Hallejus *obſervarat, quaque ad differentiam Meridianorum* Londini & Gedani *uſus ſum, cùm* Hallejum *interrogarem, ingenuè faſſus eſt, nec accuratè admodum, nec ſatis amplis Inſtrumentis obſervationem eam factam fuiſſe. Incerta igitur inter duo minuta horaria manet etiamnum Meridianorum noſtrorum*

diffe-

differentia, quam tamen nullus dubito nos pro votis aliquando determinaturos esse, si modò Mensis hujus *phænomenis observandis utrique nostrùm optata cœli serenitas pariter suppetierit.*

Conjecturas de futuris Anni hujus phænomenis in Diario editas festino calamo describebam: Unde evenit, quòd quosdam Appulsus, sed pauculos omisi; quos tamen, exinde iterum perlustratis Lunæ diurnis motibus in Ephemeride, prævidi. Horum præcipuus erat Lunæ supra Jovem *transitus, quem die Lunæ* Februar. 28. *St. vet. mane, ut sequitur, observavi.* V. Fig. 2. suprà, p. 557.

Hora horologii correcta.

h.	′	″		°	′
4.	20.	15.	♃ à limbo Lunæ lucido	26.	9.
4.	47.	0.	☽æ. capta diameter	31.	30.
4.	49.	30.	♃ à cuspide proximo	26.	28.
4.	52.	15.	♃ rectam per cuspides ductam præterierat decimâ parte distantiæ vel 3′ circiter, ocular! per tubum conjecturâ.		
4.	56.	0.	♃ à cuspide	27.	33.
5.	1.	15.	-- à recta per cuspides	7.	53.
5.	3.	30.	-- à cuspide	28.	22.
5.	7.	25.	-- à recta	9.	58.
5.	10.	50.	-- ab eadem	11.	55.
5.	15.	50.	-- à cuspide	30.	27.
5.	21.	20.	-- à limbo remotiori. dub.	62.	4.
5.	26.	0.	-- à cuspide proximo	33.	0.
5.	31.	25.	-- à recta per cuspides	20.	9.
5.	37.	0.	-- à cuspide	36.	15.
5.	41.	10.	-- ☽æ altæ 10½ g. diameter circ.	31.	53.
5.	48.	30.	differentia altit. limbi ☽æ inferioris & ♃.	23.	1.
5.	52.	40.	♃ à cuspide proximo aberat	41.	40.
6.	9.	40.	- à cuspide	47.	29. dubia.
6.	19.	40.	Lux diei fortior adeò ☽æ cuspides hebetarat, ut, *Jovem* etiamsi potuerim videre, ejus tamen ab iis distantias diutius non potuerim determinare.		

Orientem Lunam à conspectu meo detinuêre primùm Horizontis colliculi, & deinde vapores, ad usque h. 4. 20′, *cùm* Jovis *per eos languidè emicantis, primùs à limbo Lunæ distantiam cepi: Sed protinùs nebula superveniens eam rursus excepit, nec conspiciendam iterum permisit ante* h. 4. 47′; *tunc autem nebulâ subitò discussâ,* Jovem *clarè vidi cum Satellitibus, lætissimaque usus fui ad exortum Solis serenitate. Maturior, horâ ferè dimidiâ, apparuit* Jovis *ad rectam per cornua ductam appulsus, quam promiserant Ephemerides. Præterea an à vobis observatum hoc phænomenon fuerit, scire plurimum cupio.*

Apparuisse

Apparuiſſe in Germania Cometam *audivi, menſe Decembris; nuſquam tamen ipſe conſpexi, nec à noſtris alicubi viſum intellexi.*

Heſternâ nocte monitu tuo excitus, Cœlos infra Procyonem *perluſtrans,* Nebuloſam *offendi, latam, & Stellulis confertiſſimam. Hanc eandem credo, quam Tu obſervaſti; certior eſſem, ſi quanta ejus fuerit Declinatio vel Altitudo meridiana, indicaveris. Novam etiam in Pectore* Cetis *ſæpius ante octo menſes vidi, nec minorem quàm Tu innuis. Sed de* Mercurio *nihil pronunciare poſſum, ſiquidem nullas circa ipſum circumpoſitas fixas intra tubi capacitatem inveni; & ampliora nondum confecta ſunt Inſtrumenta, quibus ejuſdem à Stellis remotioribus diſtantiæ ritè capi poſſint. Vale, Vir Clariſſime, &, ſi quas Occultationum futurarum Obſervationes Cœli indulſerint, perge, ut cœpiſti, me earum facere participem. Ego meas viciſſim lubentiſſimè ſemper concedere paratus ſum.* Grenovici, *A.* 1676. *Martii* 4.

An Account of Books.

I. Ἀρχιμήδους τῶ Συρακουσίου Ψαμμίτης, ἢ Κύκλου Μέτρησις: Εὐτοκίου Ἀσκαλωνίτου εἰς αὐτὴν ὑπόμνημα, &c. *Cum Verſione & Notis* Joh. Wallis *SS. Th. Doct. Geometriæ Profeſſoris Saviliani. Oxonii è Theatro Sheldoniano,* 1676.

THough this Tract of *Archimedes* his *Arenarius* have been formerly twice printed in *Greek,* and thrice in *Latin*, yet did the Learned Dr. *Wallis* ſee cauſe enough to publiſh another Edition, therein preſenting us with many emendations in the Original, and with a new Verſion in *Latin*, and adding ſome ſhort ſtrictures ſerving to illuſtrate the ſenſe thereof. And the Book ſeemed to deſerve theſe pains, as being not only an elegant and acute piece, worthy of *Archimedes*, but alſo an excellent Monument preſerving both a piece of remote Antiquity, as is that of *Ariſtarchus Samius* his Hypotheſis, revived by *Copernicus*, and that of the *Dorick Dialect* in Proſe. Beſides, it exhibits the foundation laid of the *Art of Numbring* or rather *Noting of numbers*, now in uſe amongſt us, with *Saracenique* or rather *Indian* Cyphers. And it accommodates thoſe numbers $\alpha, \beta, \gamma, \delta, \varepsilon$, &c. not only to numbers proportional in a *deſuple ratio*; but alſo to any others, in any *ratio* whatſoever, that are in a continual proportion from the Unite: And they are the ſame with what is commonly call'd *Unit*, *Root*, *Quadrat*, *Cube*, *Biquadrat*, to wit,

$$\alpha \quad \beta \quad \gamma \quad \delta \quad \varepsilon \quad \zeta \quad \eta, \text{ \&c.}$$
$$1 \quad a \quad aa \quad a^3 \quad a^4 \quad a^5 \quad a^6, \text{ \&c.}$$

As to the argument of the Book, 'tis well enough known to the Curious, that it Geometrically ſhews a number exceeding that

which is equal to the number of the Sand, capable to fill up not only the whole Earth and its cavities, but also the whole World.

To this Tract of the *Number* of the *Sand*, is added that other of the same *Archimedes*, touching the *Dimension of a Circle*, because 'tis several times quoted in the former, as the foundation of his *Calculus*; nor did it want emendation. To it is annexed *Eutocius* his short Commentary upon the said Dimension, which exhibits a *Specimen* of the form and manner, wherein the later *Greeks* were wont to write their Comments upon their more ancient Authors; and shews withal, how laborious it was to make Multiplications, Divisions, and Extractions of roots before the use of the *Indian* Cyphers was introduced, as also after what manner they were performed.

II. *Observationes Medicæ circa* MORBORUM ACUTORUM HISTORIAM ET CURATIONEM; *Auth.* Thoma Sydenham *M. D.* Londini, *in* 8°.

The Author of this Treatise, aiming principally in his Practise of Physick to contribute what he can to the real and constant cure of all Diseases, and being well aware of that great *desideratum* in Physick of faithfully recording such Medical Observations and Methods of Cure, as by candid and careful Physicians are made, and with success employ'd, resolved at length, after many solicitations of those of his Friends that knew his Practise, and his constant endeavours of improving the same for the common benefit of Mankind, to publish these his Observations, relating to the History and the successful and certain Cure of *Acute* Diseases, waving therein all Philosophical *Hypotheses*, and delivering nothing but genuin matter of Fact; distinguishing withal the peculiar and constant *Phænomena* of Diseases from those accidental and adventitious; and very carefully observing the aptness of the several Seasons of the Year to occasion the several sorts of Diseases reigning in them.

Now this History and Cure of Acute Diseases here described, comprehends his Observations of the fifteen last years of this Age; a competent time, for rendring an account of the distinct *species* of Epidemicals, which not only fortuitously invade us, but are in one year, or in a certain *series* of years, of one and the same kind, and in other years different from one another.

To descend to the particular Matter here performed, our Author hath observ'd, that from the years 1661 to that of 1676. there have reigned *five* several Constitutions of the Air,

Air, which have produced as many *ſpecies* of Epidemical Diſeaſes and Feavers ſeverally named.

Of theſe he calls the *firſt* the *Continual Depuratory* Feaver, laſting from 1661 to 1665, which he eſteems to be the principal Feaver of *Nature*, foraſmuch as therein ſhe doth ſo regulate all the Symptoms, as to diſpoſe the Febrile matter, when duly digeſted and prepared, to be diſcharged either by a competent ſweat or a liberal tranſpiration. Here he records divers important Obſervations of his, and notes the ſeveral ſymptoms of the Diſeaſe, the Method of cure, and the Diet of his Patient, both during the Diſeaſe and after it; concluding this Head with deſcribing the nature, ſymptoms and cure of the *Intermittent* Feavers bred in this firſt Conſtitution.

The *ſecond* Epidemical Conſtitution of another kind he obſerves to have been in *London* in the years 1665 and 1666. This kind he calls *Inflammatory*, of which nature the *Plague* or Peſtilence was in the higheſt degree, ſweeping away, when it was in its height, 8000 in one week, more or leſs. Here he takes notice, that for rendring a rational account both of ſuch waſting Diſeaſes as this, and of ſuch that are very gentle, it may be ſuppoſed, that ſometimes the conſtitution of the body of the Air is ſuch that it breeds Diſeaſes that carry away innumerable People; at other times it afflicts but a very ſmal number of them; though it be yet very obſcure to us, wherein that different texture of Air, that hath ſuch different effects, doth conſiſt.

Now of this *ſecond* ſort he very particularly deſcribes alſo the ſeveral ſymptoms, and the difficulties occurring in reſpect of thoſe Phyſicians that adviſe and uſe *Venæ-ſection* in the Plague: Where he relates a ſtrange example of the good ſucceſs thereof here in *England*; as alſo his own uſe of bleeding in this diſtemper for a while, together with his reaſon of deſiſting from it, and the method by him employ'd afterwards, and the ſucceſs thereof.

The *third* Epidemical Conſtitution, deſcribed by him, did obtain in the years 1667, 1668, and part of 1669; and it was that of the *Small-pocks*, and of a *Variolous* Feaver, reſembling (except the eruption of the puſtuls) the Smal-pocks, in ſymptoms and duration, and vaniſhing with the Small-pocks. This was accompanied with a *Diarrhœa*, eſpecially at the later end of it; & it approached ſo near the nature of the Small-pocks, that it ſeem'd to be nothing elſe,

but the ſame turn'd inward and incumbent on the *viſcera*. The Phænomena, Symptoms, and cure of this Feaver, and the difference between the Diſtinct and the Flox-pox, and the ſlaughter of thouſands ſick of theſe Pox for want of a due Method in treating the patients, and many other conſiderable remarks, are with great care and skill deliver'd by the Author.

The *fourth* Epidemical Conſtitution here diſcourſed of, was here in vogue An. 1670, 1671, 1672, and is by our Author call'd the *Dyſenterical* Feaver, accompanied with the Meaſels, and the *Cholera morbus*, and follow'd by a Bilious Colick: All deſcribed as to their effects and method of cure, with the like care and caution, as the fore-going.

The *fifth* Conſtitution that obtained here was An. 1673, 1674, 1675, *viz.* A Feaver of a very Anomalous nature, to which the *Dyſentery* and *Diarrhæa* were only ſymptomical, not eſſential, and upon which ſurven'd Epidemical coughs, with Pleureſies and *Peripneumonia*'s; as theſe five conſtitutions were *Stationary*, ſo they had ſome *Intercurrent* Feavers, as the *Scarlet-feaver*, the *Baſtard Peripneumonia*, the *Rheumatiſme*, the *Eryſipelas*, and the *Angina*, which are alſo accurately deſcribed by our Author, both as to their *Phænomena* and Cure. See the Author himſelf both for his Obſervations and manner of the Cure.

III. *De CONSENSU VET. ET NOVÆ PHILOSOPHIÆ Libri IV, ſeu Promotæ per Experimenta Philoſophiæ pars prima: Authore* J. B. Du Hamel *P. S. L. & Regiæ Scientiarum Academiæ à Secretis, in* 12°.

In this ſecond and conſiderably augmented Edition the worthy and Learned Author performs four things in ſo many Books.

In the *firſt*, he gives an account of the Principles of the *Platonick* Philoſophy, and ſhews the difference between it and the *Peripatetick*; delivering in the ſame the Natural Theology of the *Platoniſts*, and diſcourſing fundamentally, from their Principles, of the Exiſtence of God, and his Providence and Concourſe; then of the Origine as well as the Spirit of the World; not forgetting to ſhew, how that Philoſophy endeavours to raiſe the Mind to the conſideration of Eternal and Primæval notions, and having diverted it from immerſing it ſelf into unſtable and periſhable things, converts it to ſuch as are only perceived by the Intellect; which our Author, duely pondering the dignity of Humane Nature, eſteems to be of

exceeding

exceeding great importance, especially since the world now swarms with those that are so very sensual as to contend, that nothing can be understood but Body.

In the *second* Book he explains *first* the Principles of *Aristotle*, and discourses at large of the nature and origine of *Formes*; yet without determining here, whether the Forms of living substances or the qualities of Bodies are things different from matter, or not. *Next*, he treats of the *Epicurean* Philosophy, as less difficult and more obvious; discoursing of Atoms, their nature and figures of continuity, and the manner of the cohæsion of Atoms, as also of vacuity, *&c.*

Thirdly, he explains the *Cartesian* Principles; where he hath *first* a large discourse about the nature of a *Physical* Body, endeavouring to evince, that the essence of it consists not in a trine Dimension, & to shew, that the *Idea* of the three dimensions, (than which *Des Cartes* contends we can have no other of a Body,) is the *Idea* only of a *Mathematical*, not a Physical Body. *Secondly*, he treats largely of the Nature and Law of Motion. *Thirdly*, of the Elastique motion, and the causes of that motion, and of the manners in which it is communicated; as also what difference there is in the configuration of the parts in Springy Bodies, from those that have no Spring; inquiring also, in the Appendix to this Treatise, into the efficient causes of Elasticity, concerning which he delivers the sentiment of Mr. *Perrault*, after he had alledg'd the *Materia subtilis* of *Des-Cartes*, and the ignited Atoms, and the *Effluvia* of Bodies, which as so many wedges do dilate the constricted passages of the inflected Body. As to the opinion of Mr. *Perrault*, he supposes, that the ambient Air is of two sorts; *one* thicker, composed of particles of Earth, Water, *&c.* inspired by us, not pervading glass nor any other solid body; the *other*, far subtiler and more penetrant, intermingled with the thicker, almost after the manner that quick-lime is mixed with sand, both swimming and moving in the *æther*, and mixed with it as lime is mingled with water. Moreover, that as the thicker Air, which extends it self to some miles, hath its weight, so the more subtile hath a greater weight (many Experiments evincing both.) Now to this subtile Air Mr. *Perrault* ascribes the Elastique power and other affections, as the firmness and cohæsion of Bodies; forasmuch as the corpuscles, which compose every thing, having plain and flat and manifold superficies's, cannot

cannot be pull'd asunder, but they must remove the neighbouring parts of the Air from their place, and by doing so somewhat raise the mass of the Air incumbent, they being every where pressed from the environing Air, no otherwise than a Body immersed in water is on all sides compressed by water. Wherefore as often as a firm body, *e. g.* the branch of a tree, is bent, the convex parts thereof are somewhat forced asunder; but when that exterior force ceaseth, than every part recovers its proper figure and scite; and this, he saith, is mainly effected by the weight of the subtiler Air, *&c.*

In the *third* Book he treats amply of the four Elements, commonly so called, *Fire*, *Air*, *Water*, and *Earth*: where occur many considerable Observations concerning *Fire* and *Air*. The *Epicurean* notion of Fire is here explained, and the *Cartesian* likewise; and those particulars discussed, that seem difficult in the later. There are also recited many *phænomena* of Flame, and the latent fire in Lime and other Bodies ingeniously discoursed of: Moreover, what is the nature and use of the Air, what the nature of the *Æther*; together with the many Experiments about the Spring of the Air, made in the *Machina Boyliana*, in *England* and elsewhere, *&c.*

In the *fourth* are explained the Principles of *Chymistry*, the mixture and dissolution of Bodies, *Fermentation &c.* This also is full of new Experiments and Observations, made here and in *France*, and other Countries. So that there being represented in this new Edition, as in an Epitome, most of the subjects and enquiries of Natural Philosophy, and they treated with much plainness and elegancy, it may be of great use to young Students in Philosophy to instruct themselves in all those matters with brevity and delight.

IV. Of EDUCATION, especially of Young Gentlemen, in two parts, the second Impression with Additions; Printed at the Theater Oxon. 8o.

That eminently Learned and Famous Knight Sir *Henry Wotton*, did long since, at the end of his *Elements of Architecture*, promise, as devoted to the service of his Countrey, a *Philosophical Survey of Education*, which is indeed (says he) a *Second Building* or Repairing of Nature, and a kind of *Moral Architecture*. This he promised An. 1624; and he made many Essays, and began some Chapters, but could never bring his design to so much perfection, as could give satisfaction to his own mind and intentions. This our

Author

Author, who is pleaſed to conceal his Name, is very full and punctual, with Inſtructions proper for all conditions of human life, particularly for the Generous.

The wiſeſt of all Ages have taken care of Education, as fundamental to proſperous Government, and the beſt & moſt ſeaſonable help to good Literature. *Solomon* for the Eaſt, and *Daniel*, had there an extraordinary felicity. *Socrates*, *Plato*, *Xenophon*, *Iſocrates*, and the Sententious ſmall Poets, as we call them, are, in their ſeveral capacities, for *Greece*. *Cicero* and *Quintilian*, above all others, for ſound Wit and Eloquence, and peculiarly for their *Orator*, which ſhould be their perfect, compleat and honeſt (that is, in their Style, Honorable) Man among the *Romans*. And ſome of the acuteſt of our Modern have been free of their *Adviſo*'s to prompt the Studious: *Bodin*, for Hiſtory; *Clapmarius* in his *Nobile Studiorum Triennium*. Alſo *Grotius*, in one or two ſheets; *Sturmius*, with like brevity; *Chr. Colerus* *De Studio Politico*; and *Caſſelius* in a touch: *Joac. Focani De ratione Studiorum Diſſertatio*: For choice or variety of Books, *Drexelius*. And *Gabr. Naudæi Bibliographia Politica*, and his Inſtructions for erecting a Library, elegantly Engliſh'd by Worthy Mr. *Evelyn*. Many curious *French* have done well for the main; *J. M.* argutely in an Engliſh ſheet, *&c.*

But this our Author hath reduced the beſt of Antient and Modern *Adviſo*'s into a compact Method, and interlac'd it with a very great variety of his own ſeaſonable ſuggeſtions. I ſhall give no judgment upon the particulars; and the whole is compoſed ſo ſuccinctly, that it needs not nor admits any other breviat. But I dare affirm it, that this Treatiſe is ſingularly worthy to be peruſed by all the Ingenuous, that are or may be concern'd in thoſe Fundamental affairs; as worthy alſo to come forth from the *Famous Theatre of Oxford*.

III. *Bathonienſium & Aquisgranenſium* THERMARUM *Comparatio, variis adjunctis illuſtrata à R. P.* Londini, *impenſis* Joh. Martyn, *ad inſigne Campanæ in Cœmeterio D.* Pauli, 1676. *in octavo.*

THe ingenious compariſon that is made in this Tract of theſe two Baths, regards their Antiquity, Scituation, Structure, Cauſe of their Heat, Minerals that are their Ingredients, and their Medicinal Virtues; further, their Number, Difference, and Form:

Form: To which is added the diversity of Time, when the waters of these Bathes are to be used; together with the Recreations and Divertisements that occur in both places.

VI. VIRETUM BRITANNICUM, or a Treatise of Cider, and such other Wines and Drinks, as are extracted from all manner of Fruits growing in this Kingdom; with the Method of propagating all sorts of Vinous Fruit-Trees. And a Description of a New invented Ingenio *or Mill, for the more expeditious and better making of Cider. Also the method of making* Metheglin *and* Birch-Wine; *with Copper-plates: By* J. W. *Gentleman in octavo.*

THis is done by the worthy Author of *Systema Agriculturæ* in *Fol.* who, by the Printer's fault, was omitted *Num.* 114, *p.* 322. and only mentioned in the *Errata* at the end of *Numb.* 115, though he deserves Recommendations much larger than I am able to give, for his great merits towards the Publick.

Printed by *T. R.* for *John Martyn*, Printer to the *Royal Society* at the *Bell* in St. *Paul's Church-Yard.*

PHILOSOPHICAL TRANSACTIONS.

April 24. 1676.

The CONTENTS.

Mr. Francis Vernon's *Letter, giving a short Account of some of his Observations in his Travels from* Venice *through* Istria, Dalmatia, Greece, *and the* Archipelago, *to* Smyrna. *Advertisements on the* Vinetum Britannicum, *(mentioned in the last fore-going Tract) which were made and sent to the Publisher by Dr.* John Beale *of* Yeovil *in* Somersetshire. *Monsieur* Hevelius's *Observations of the Lunar Eclipse of the First of* January *last, n. st. at* Dantzick. *An Account of three Books:* I, *and* II. *in one Volume*, viz. *Memoires pour servir à l'Histoire Naturelle des* ANIMAUX; *and*, La MESURE *de la* TERRE. III. BRITANNIA ANTIQUA *Illustrata, or, The* ANTIQUITIES *of* ANCIENT BRITAIN, *derived from the* Phœnicians; *the First Volume: By* Aylett Sammes *of the Inner Temple, &c.*

Mr. Francis Vernons *Letter, written to the Publisher* Januar. 10*th.* 167⅝, *giving a short account of some of his Observations in his Travels from* Venice *through* Istria, Dalmatia, Greece, *and the* Archipelago, *to* Smyrna, *where this Letter was written.*

SIR,

I Must beg your excuse for not having written to you in so long a space: The little rest I have had, and the great unsetledness of my condition is the reason. Neither have I now any great Curiosities to impart to you; only some small circumstances of my Journey I will run over.

From *Venice* I set out with those Gallies which carried their Ambassadour that went for the Port. We touch't at most of the considerable Towns of *Istria* and *Dalmatia* by the way. In *Istria* we saw *Pola*, an ancient Republick. There remains yet an Amphitheatre entire: It is of two orders of *Tuscan* Pillars, placed one over another, and the lower Pillars stand on pedestals, which is not ordinary; for, commonly they have nothing but their *Bases* to support them. There is, besides a Temple dedicated to *Rome* and *Augustus*, a Triumphal Arch, built by a Lady of the family of the *Sergii*, in honour of some of her kindred, which commanded in these Countries; besides several Inscriptions and ancient Monuments, which are in divers parts of the Town.

In *Dalmatia* I saw *Zahara*, which is now the Metropolis of the Country. It was anciently called *Jadera*. It's now very well fortified, being encompass'd on three sides with the Sea, and that part which is toward the land extreamly advantaged by all the contrivances of Art, having a Castle and a Rampart of very lofty bastions to guard it. I found here several ancient Inscriptions, by me copied, which will not find room in the compass of a Letter. We past in sight of *Zebenico*, and saw three Forts, which belong to the Town, St. *Nicolo*, St. *Giovanni*, and *la Fortezza Vecchia*; but we went not a shore. That which is most worth seeing in *Dalmatia*, is *Spalatro*; where is *Diocletian*'s Palace, a vast and stupendous fabrick, in which he made his residence, when he retreated from the Empire. It is as big as the whole town; for the whole town indeed is patch't up out of its ruines, and is said by some to take its name from it. The building is massive; there is within it an entire Temple of *Jupiter*, eight-square, with noble Porphyrie pillars, and Cornice, worth any bodies admiration. There is a Court before it, adorned with *Ægyptian* pillars of that stone called *Pyropoicilos*, and a Temple under it, now dedicated to Sta *Lucia*; and up and down the Town several fragments of Antiquity, with Inscriptions and other things, worth taking notice of.

Four miles from *Spalatro* is *Salona*, which shews the ruines of a great Town. About as much farther from *Salona* stands *Cliffa* upon a rocky Hill, an eminent Fortress of the *Venetians*, which is here the frontier against the Turk; from whence they repulst him in their late wars with great honour. I was at *Lesina*, where is

nothing

nothing very remarkable; but *Biondi*, that hath written our Engliſh Hiſtory, was of it. *Trau* is ancient, and hath good marks of its being ſo. Here I ſpoke with Doctor *Staſileo*, who put out that fragment of *Petronius Arbiter*; and I ſaw his Manuſcript.

I was in the harbour of *Raguſi*, but not in the town, becauſe we made no ſtay there. From hence we paſt the gulf of *Budua*, and ſaw the Mountains of *Antivari*, the Plain of *Durazzo* and *Apollonia*, and came to *Saſſino* a ſmall Iſland, from whence we could ſee the town of *Valona*, and the mountains *Acroceraunii*, which are very near, and are now called Mountains of *Chimæra*.

I ſtay'd a fortnight in *Corfu*, and had time to view all that was conſiderable in the Iſland, particularly the Gardens of *Alcinous*, that is, the place where they are ſuppoſed to have been, now called *Chryſida*; a moſt delicious ſcituation: The ancient Port, now called Νικοδήλαζος, and ſeveral foundations of ancient fabricks. In *Zante* I was likewiſe a fortnight, where I ſaw but little of Antiquity: What is Modern, is very flouriſhing, and the Iſland rich and plentiful.

I went from *Zante* to *Patras*, a town in *Achaia*, of good note among the Ancients. Near it is a great Mountain, mention'd by *Homer* by the name of *Petra Olenia*. In the town are ſeveral maſſive ruines, which few there know how to give any account of. There are the remains of a large Church, dedicated to St. *Andrea*, who, they ſay, was Martyr'd there. This is the firſt town I ſaw on the Continent of *Greece*. The Plain about it is very fruitful, full of ſprings and rivolets; finely wooded with Olive-trees, Cypreſſes, Orange and Lemon-trees. The Citrons here are counted among the beſt of the *Turkiſh* Empire, and are ſent for Preſents to *Conſtantinople*. So are all their Fruits in very good eſteem.

In *Athens* I have ſpent two months. Next to *Rome* I judge it the moſt worthy to be ſeen for Antiquities of any I have yet been at. The Temple of *Minerva* is as entire as the *Rotunda*. I was three times in it, and took all the dimenſions, with what exactneſs I could; but it is difficult, becauſe the Caſtle of *Athens*, in which it ſtands, is a garriſon, and the *Turks* are jealous, and brutiſhly barbarous, if they take notice that any meaſures it. The

length of the *Cella* or Body of the Temple without-side, is ——— 168 } Feet } These measures you may rely
The breadth — 71 } English. } on, as exact to ½ a foot.

The *Portico*, of the *Dorique* Order, which runs round it, hath 8 Pillars in front, 17 on the sides; the length of the Portico is 230 feet English. I have taken all the dimensions within, with those of the πρόναος and Portico's; but they are too long for a Letter. The *fuste* or shaft of the Pillars is 19½ feet in circumference: The *Intercolumnium*, 1¼ of the diameter of the pillars.

The Temple of *Theseus* is likewise entire, but 'tis much less, though built after the same model: The length of its *cella* is but 73 feet, the breadth, 26. The whole length of the *Portico*, which goes round it, 123 feet. 'Tis a *Dorique* building, as is that of the *Minerva*. Both of them are of white Marble.

About the Cornice on the outside of the Temple of *Minerva* is a *basso relievo* of men on horseback, others in Chariots; and a whole procession of people going to a sacrifice of very curious sculpture. On the Front is the history of the Birth of *Minerva*.

In the Temple of *Theseus* on the Front within-side the *Portico*, at the West-end, is the battle of the *Centauri*; and at the East-end seems to be a Continuation of that history: But there are several figures of Women, which seem to be *Pirithous*'s Bride, and those other Ladies which were at the wedding. On the outside the *Portico*, in the spaces between the *Triglyphi*, are several of the prowesses of *Theseus*, most in Wrestling with several persons, in which he excelled: All his postures and locks are expresst with great art. Others are Monsters, which he is made encountring with, as the Bull of *Marathon*, the Bear of *Calydon*, *&c.*

There is a Temple of *Hercules*, a round fabrick, only of six feet diameter, but neat architecture. The Pillars are of the *Corinthian* order, which support an Archi-trave, and Frise, wherein are done in *relievo* the Labours of *Hercules*. The top is but one stone, wrought like a Shield, with a flower on the outside, which riseth like a plume of Feathers.

There is yet standing the Tower of *Andronicus Cirrhestes*, which is an Octogone, with the figures of 8 Winds, which are large, and of good workmanship; and the names of the Winds remain legible

gible in fair Greek characters, (where a Houſe, which is built againſt it on one ſide, does not hinder;) as ἀπηλιώτης, νότος, βορέας, σκίρων, ζέφυρος. Each Wind placed againſt its quarter in the heavens; and the roof is made of little planks of Marble, broad at bottom, and which meet all in a point at top, and make an obtuſe pyramid of ſome 32 or 36 ſides.

There is a delicate Temple of the *Conique* order in the Caſtle, whether of *Pandroſos*, or whom, I cannot tell; but the work was moſt fine, and all the ornaments moſt accurately engraven: The Length of this Temple was 67 } Feet.
The Breadth——————— 38 }

Theſe Pillars which remain of a Portico of the Emperour *Adrian*, are very ſtately and noble: They are of the *Corinthian* order, and above 52 feet in height, and 19½ in circumference: They are canellate; and there are now ſtanding ſeventeen of them, with part of their Cornice on the top. The building, to which they belonged, I meaſured the Area of, as near as I could conjecture; and found it near a *thouſand* feet in length, and about *ſix hundred and eighty* in breadth.

Without the Town, the Bridge over the *Eliſſus* hath three arches, of ſolid ſtone-work: The middlemoſt is near 20 feet broad. There is the *ſtadium* yet to be ſeen, whoſe length I meaſured, and found it 630 feet, near to what the preciſe meaſure of a *ſtadium* ought to be, *viz.* 625.

Towards the Southern wall of the Caſtle there are the remains of the Theater of *Bacchus*, with the Portico of *Eumenes*, which is near it; the ſemi-diameter, which is the right Sine of the demi-circle which makes the Theatre, is about 150 feet. The whole Body of the Scene, 256. Monſieur *de la Guilliotiere* in that Book he hath written of *Athens*, hath made a Cut of a Theatre, which he calls that of *Bacchus*, which is a meer fancy and invention of his own, nothing like the Natural one, which by the Plan, he has drawn of the Town, I judge he did not know. I give you this one hint, that you may not be deceived by that Book, which is wide from truth; as will appear to any body who ſees the reality, though to one who hath not ſeen it, it ſeems plauſibly written. I have dwelt long on *Athens*, but yet have ſaid nothing. This Town alone deſerves a whole Book to diſcourſe of it well, which now I have neither time nor room to do; but I have Memorials

by

by me of all I saw; which one day, if it please God, I may shew you.

Thebes is a large Town, but I found few Antiquities in it, excepting some Inscriptions and Fragments of the Old Wall, and one Gate, which, they say, was left by *Alexander*, when he demolish't the rest. It is about some fifty miles distant from *Athens*, as I judge.

Corinth is two daies journey distant: the Castle or Ἀκροκόρινθος is standing, which is very large. The main of the Town is demolish't, and the houses, which now are scatter'd, and a great distance from one another. So is *Argos*, which to go round would be some four or five miles, as the houses now stand; but if they stood together, they would scarce exceed a good Village. *Napolo della Rumilia* is a large town, and full of Inhabitants, and the Basha of the *Morea* resides there: It is but very few leagues distant from *Argos*.

Sparta is quite forsaken; and *Mestra* is the Town which is inhabited, four miles distant from it. But one sees great ruines thereabout; almost all the Walls, several towers and foundations of Temples with pillars and chapitres demolish't: A Theatre pretty entire. It might have been anciently some five miles in compass; and about a quarter of a mile distant from the River *Eurotus*. The Plain of *Sparta* and of *Laconia* is very fruitful, and long, and well watered. It will be about eighty miles in length, as I judge. The Mountains on the West-side of it very high, the highest I have yet seen in *Greece*; the *Maniotes* inhabit them. But the Plain of *Calamatta*, which anciently was that of *Messene*, seems rather richer. *Corone* is very abundant in Olives. *Navarrino*, which is esteem'd the ancient *Pylos*, hath a very strong Castle, fortified by the *Turks*, and is the best Port in all the *Morea*. *Alpheus* is much the best River, and the deepest, and with great reason extolled by all the ancient Poets, and chosen for the seat of the Olympick Games; for its very pleasant. The Plains of *Elis* are very goodly and large, fit to breath Horses in, and for hunting; but not so fruitful as that of *Argos* and *Messene*, which are all riches. The best Woods I saw in *Peloponnesus* are those of *Achaia*, abounding with *Pines* and wild *Pear*, the *Ilex* and *Esculus*-trees, and, where there runs water, with *Plane*-trees.

Arcadia

Arcadia is a very goodly Champain, and full of Cattle, but is all encompaſt with Hills, which are very rough and unhewn. *Lepanto* is very pleaſantly ſeated on the Gulf, which runs up as far as *Corinth*; and without the Town is one of the fineſt Fountains I ſaw in *Greece*, very rich in veins of Water, and ſhaded with huge Plane-trees; not inferiour in any thing to the Spring of *Caſtalia* on Mount *Parnaſſus*, which runs through *Delphos*, except in this, that one was choſen by the Muſes, and the other not; and Poetical fancies have given immortality to the one, and never mentioned the other.

Delphos it ſelf is very ſtrangely ſcituated on a rugged hill, to which you have an aſcent of ſome two or three leagues; and yet that is not a quarter of the way to come up to the Pique of *Parnaſſus*, on the ſide of which hill it ſtands. It ſeems very barren to the eye; but the Fruits are very good, where there are any. The Wines are excellent, and the Plants and Simples, which are found there, very fragrant and of great efficacy.

About *Lebadia*, and all through *Bæotia*, the Plains are very fertile, and make amends for the barrenneſs of the Hills which encompaſs them: But in Winter they are apt to be overflown for that reaſon, and to be turn'd into Lakes; which renders the *Bæotian* Air very thick, and ſo were their Skulls too, if the Ancients may be believed concerning them; though *Pindar*, who was one that ſublimated Poetry to its higheſt exaltation, and is much fancied and imitated in our Age, as he was admired in his own, was born there: And *Amphion*, who was ſaid to be ſo divine in his Muſick, that he raviſht the very ſtones, had skill enough to entice them to make up the Walls of *Thebes*: So that not every thing that's born in a dull Air, is dull. Theſe Vales I found much planted with *Cotton*, and *Seſamum*, and *Cummin*, of which they make great profit and a great trade at *Thebes* and *Lebadia*.

I went from *Thebes* into the Iſland of *Eubæa* or *Negropont*, and ſaw the *Euripus*, which ebbs and flows much after the nature of our Tides; only the Moon, and ſometimes Winds, make it irregular. The Channel, which runs between the Town, and a Caſtle, which ſtands in an Iſland over againſt it, is ſome fifty feet broad; and there are three Mills on it, which ſhew all the changes and varieties that happen in the Current. Near the *Euripus* and oppoſite to the Town, they ſhew a Port, which they ſay was *Aulis*, and it is not improbable;

bable; for it must be thereabouts. Between *Negropont* and *Athens* is a high Hill, called Αγομαχέα, formerly very dangerous, but now guarded by *Albaneses*: It is part of Mount *Parnasse*; and near it on the left hand lies Mount *Pentelicus*, from whence the *Athenians* anciently fetcht their Stone, and now there is a Convent of *Caloieri's* there, one of the richest of all *Greece*.

In going from *Athens* by Sea, I embarqued in a Port, which lies just by *Munichia*: That which they call *Porto Pyræo* lies behind it a mile distant, which is a large Port, able to contain 500 Vessels. There are the ruins of the Town yet remaining, and of the walls, which joyn'd it to the City of *Athens*. I sailed by *Porto Phalero*, the ancient Haven of *Athens*, which is rather a Road than a Port. I saw an Island called Φλίσσα, where the *Athenians* had anciently Mines. I went a shore on the Promontory of *Sunium*, to view the remains of the Temple of *Minerve*, which stood on it. Hence I sailed among the Isles of the *Archipelago*, *Macronesia*, *Thermea*, *Serphanto*, *Siphanto*, till I came to *Melo*. From *Melo* I sailed through the *Cyclades* to come hither. I past by *Andros*, *Tenos*, *Mycone*, *Delos*; *Naxia* and *Paros* I saw at a distance. We sailed near the Northern Cape of *Sio*, and the Southern of *Mytilene* or *Lesbos*, and so came into the Gulf of *Smyrna*. Within this Gulf stands *Burla* near some small Islands, which is judged to be the ancient *Clazomenæ*; *Foja*, which is the same with the ancient *Phocæa*: Near this the River *Hermus* discharges it self into this Gulf.

In this my Journey I had some misadventures: My Companion, Sir *Giles Eastcourt*, dyed by the way. At Sea I was plunder'd by the *Serphiotes*, where I lost all my Letters, and Yours among the rest, which you sent to My Lord Ambassadour at *Constantinople*, and *Consul Rycaut*, whom I find here a very civil and knowing Gentleman, and am much obliged to him for his favours.

I have been as curious as I could in taking the latitudes of some remarkable places: As I find them, I shall give them you:

	Gr.	m.			Gr.	
Athens	38.	5.	*Patras*		38.	40.
Corinth	38.	14.	*Delphos*		38.	50.
Sparta	37.	10.	*Thebes*		38.	22.
Corone	37.	2.	*Negropont* or *Chalcis*		38.	31

I desire you to present my humble Services to the Gentlemen of the *Royal Society*. I am, *&c.*

Adverti-

Advertiſements on the Vinetum Britannicum *mentioned in the laſt foregoing Tract, ſent to the publiſher by the Reverend Dr.* J. Beal *Rector of* Yeovil *in* Somerſetſhire *and one of His Majeſties Chaplains.*

Sir,

WIth much regard to the worthy Author of *Vinetum Britannicum* for his obligingneſs towards the publick, and for the further encouragement and improvement of our Countrey in *Hortulans*, I am willing to add ſome Lines to the mention you made of it. And this Treatiſe may do much good, for the greateſt and richeſt part of *England*, in all our Champion Countries, and in the very Heart of *England*, where, through want of the aids here ſhew'd, they could do little or nothing for *Pomona*: And where an Apple cannot grow, Shrubs may proſper and bear great ſtore of delicate and rich Wine, by the help of Sugar; which, when brought into common practice, may in a ſhort time prove a great benefit to our Sugar-plantations. And 'tis a point of exceeding good Husbandry, when very ſhallow Lands may with ſmall charges and little trouble be improved to bear more delicat and more wholſom Wines, than a *French* Vineyard; and alſo find good Employment for poor Widows and Children. And hence I beg leave to joyn it together; That Mr. *J. B.* in the later part of *Epitome of Huſbandry p.* 26, 28. in his uſual plainneſs, teaches an eaſy and frugal way to raiſe profitable Gardens of *Eſculent* Plants on the barren Heaths; and this our learned Author demonſtrates, how to raiſe rich Vinous liquors in any ſhallow Land, that will bear thorns or bryars: For, in ſuch Lands moſt of our vinous Shrubs will proſper. And then any Gentleman by his own good example may lead on the multitude to drive away lazineſs, and poverty, and to enrich themſelves, by turning our waſte Grounds, Heaths, barren Lands and Downs (which contain a great part of *England*) into Gardens, and Modern Vineyards. And 'tis more honour to raiſe a Village or Townſhip with competent relief, on Land that hath been hitherto deſerted as hopeleſs, than to make depopulations on good Land, as ſome have done to their own damage.

1. The *Ingenio*'s for Cider-mills, by the Author deſcribed, are made by *John De la more*, a Joyner in *Petersfield* in *Hampſhire*, from 20. to 30. *Sh.* price a piece, according as they are ſingle or double. Note, that the former Cider-mills, whether with ſtone-caſes, or timber-caſes, are in many places, at five-fold, in ſome at ten-fold,

in some at twenty-fold above that price, and very scarce to be gotten. And *ch.* 5. *Sect.* 2. *p.* 86. he saith; *By this* Ingenio *have been ground very fine, sometimes* 4, *sometimes* 5 *bushels of Apples in an hour; and with no harder labour, than that two ordinary Labourers may (the one feeding, and the other grinding) hold it, by interchanging all the day.* And of the larger *Ingenio*, which he there also describeth, he saith *p.* 87. *By this* Ingenio *may two workmen, and one feeder, grind* 20 *bushels of Apples in an hour.* And *p.* 81. he saith; *This is a remedy against the inconveniences, troubles and expences in the several waies hitherto used*: Among which inconveniences, he there nameth *an unpleasant taste of Cider, acquired from the rinds, stems and kernels of the fruits, which in the former Mills were much bruised.* Thus the Author; and this is remarkable for them that would have the best and purest Cider. The Cider-mill, or Cider-press invented by Mr. *Hook*, is described by worthy Mr. *Evelyn* in his second Edition of *Pomona p.*66,67. I guess, that the Cider-mill, so highly recommended by Mr. *Carew Reynel* in the *True English Interest, ch.* 30. and by him there attributed to the invention of Mr. *John Worlidge* of *Petersfield*, and said to make *ten hogsheads* a day, is the same with those here named by our Author. And, if in these any thing be yet wanting, doubtless it will be soon brought to perfection, being in such skilful hands.

2. The Author saith *p.* 186; that Mr. *Rickets*, Gardiner at *Hogsdon*, and Mr. *R. Ball* of *Brainford*, can furnish any planter with all or most of all the choicest or most excellent of all the Fruit-trees mentioned in his precedent Corollary. And in that Corollary he mentions the best Fruits for liquors that I can yet hear of in *England*, at common sale. For Walnuts and Filberds, his choice is judicious: For I have observed a very great difference in the kinds; to which if he had been pleased to add (but indeed they were quite out of his road and method) the best Chestnuts, and the other excellent vegetables for diet and food, mentioned in the *French Gardiner*, he had made an advance (as well for *food*, as he did for *liquids*,) to a part of the importance of the Introduction to your *Vol.* 10, *p.*256; and of the *Breviat* on Sir *Hugh Plat. ibid. n.* 113, *p.*304. and elsewhere by you fervently sollicited, in both respects, for restorative food and for refreshing liquors of the best kinds, & by modern improvements. This I suggest afresh (out of due place) because much of this Garden-food is yet wanting in many places for Noble Tables.

Cherries,

Cherries, which do hurt eaten raw, and when the body is heated, may do much good, if made wine, or dried. I once sent you a Receipt, which I received from Mr. *Newburgh* F.R.S. (who is curiously skilful in extracting rich liquors, and justly famous for his healing extract from *Elderberries*,) how to make the best wine of *Cherries*, and to make *Plum-wine:* which later, in his way, hath an austerenes, that must be allay'd, when 'tis in the glass, with a little Sugar; and not till drawn. 'Tis but from a wild black Plum, much bigger than a damsin, round and full of juice, of no harsh or unpleasant austerity; and (doubtless) they will yield a good Spirit for *Brandy*. And some kinds of those black and russet-tawny Plums may be dried in a kind of Solar stove, made in a Summer-wall for Prunes, if your Winter do not overtake you; or, if that season faileth, they may be dried in a Culinary oven. These Trees bear abundantly, and from a small parcel of ground, of no great depth: And Cherries and Plums make haste to regratify the Planter. I have tasted a most delicious *Bonello* (or winy liquor extracted by infusions, and compounded with sugar) for the Summer heat, made of the red *Garden-currants*, by curious *Ligons* instructions. And a Noble Person, famous for a curious palat, did in my hearing extol a wine made of *Goose-berries*, beyond imagination. And I have often drank a *Rasberry-wine*, much different, and far more excellent than any of the mixtures, with Syrrup of Rasberries, or any of the ordinary infusions. By these, and other instances, which I now forbear, I am perswaded, that many Secrets for the best way of obtaining rich Vinous liquors are not yet published, and the Author is truly worthy, to whom they should be communicated. And his merits will engage him for many more Impressions. In all this I do not mean to detract from the Author's way of making *Currant-wine*, *Rasberry-wine*, or any other of his directions, but only to invite him in all to inquire the Methods which succeed best. And I am not without hope of prevailing with my worthy and friendly Neighbour Mr. *Newburgh*, to send you some of his Experiments in this kind, that the worthy Author may compare them for his next Impression. Sir *Ken. Digby*'s Post-hume hath great varietie of *Metheglins*; but he takes not a sufficient compass for other vinous liquors.

3. Our Author saith *Ch.* 5. *sect.* 9, *p.* 134; *Green and crude herbs do dull and flatten the spirits of liquors into which they are infused.*

This I have proved often, on many kinds of Vegetables, that the Plant fully ripe, and full of seeds, which are much stronger than the green leaf, will taste, if of any bitter or odious kind, less odious and less bitter, than the young leaf, and green spray, in any infusion; and will also preserve the liquor longer, and make it more quick, brisk and lively. *Centory* seeding, and boiled throughly, is more tolerable, than the green leaf or blossom, though but slightly and less than half boiled. I know a family, which made great gain by infusing *Wormwood* full of ripe seed, dried, and of a year old: Thus they made some vessels very strong; and from thence attemper'd it in Ale or Beer, more acceptable to every palat: And I have heard very learned and experienced Physicians say, that this drink did generally heal the Dropsical, Scorbutical, and such whose diseases were caused by the coldness of the Liver, or want of digestion. The right and best *Roman Wormwood* gives an Aromatick flavour, very pleasing to some when young and green; more pleasing to others, when fully ripe and kindly dried. And the tops of *red Sage* in blossom, with the top-leaves kindly dried in the shade, and with maturity of time, did excel the famous *Thea*, the *Chinois* themselves being Judges; as you have recorded it *Vol.* 1. *n.* 14. *p.* 250; and again in the aforesaid Introduction *Vol.* 10. *p.* 256. Our *Betony* is very friendly for the Head and Brain, but not, in this respect, to be compared with *red Sage*. Add, that *Fumitory* in the blossom, well dried, is tolerable. *Tansey*, *Mugwort* and *Southernwood*, are less odious when ripe and dried. Rinds of *Oranges* and *Lemons*, *Citrons*, and the like, dried; Roots of *Enula Campana*, *Horseradishes*, *Burre*, *Potadoes*, and the like, being cut into bits or slices, and a little withered, so moderately, that their Juyces be not too much wasted, are thus kindest for Infusions and Decoctions. And the tops of *Lavender*, when full of seeds, and dried, are used in Beer in *Germany*; and (as Mr. *Hartlib* told me) the *Lilly of the Valley* (which propagates it self by the weight of its seeding tops, descending into the earth,) is much esteem'd on the *Elbe*, where they have excellent Beer; and in Wine, in other parts of *Germany*, as a specifick remedy against Apoplectical dangers. He said, that in some places of *England* bushels of it may be mowed. I have not Mr. *Ray* now at hand to enquire it of him. For drinks in Spring and Summer, the first appearing

Leaves

Leaves and Bloſſoms of more guſtful Plants, by a ſhort infuſion, will ſuffice to good effect. *Baume*, the beſt delight for a Cordial: *Burnet*, moſt pleaſing in French Wine, in delicate Frontiniac, and in green Cider, (as green as the Rhiniſh glaſſes were heretofore tinged) made of a *green fillet*, as they called it, where they had other kinds of fillets. This which I commend (and tried it often) was a ſmall, round, and green Apple full of black ſpots, of a pleaſant odour and taſte, and yielded a grateful ſtomach-wine, for the extream heat of the following Summer, well agreeing with *Burnet*. The *Thymes*, denominated from Maſtic, Lemon, Muſk, Yellow and White Thyme, do make a ſprightful and ſpeedy infuſion in *Angelico*, againſt Contagions or Infections. The *Holy Thiſtle*, an expeller of bad blaſts. *Clary*, a ſtrengthner of Nature. *Sanicle*, *Comfrey*, and the *Conſounds*, healers and knitters of inward ruptures. *Burrage*, *Bugloſſe*, and *Cichory*, purifiers of the blood, calming and appeaſing of ſpirits; and the *Cowſlips of Jeruſalem*, peculiar to mitigate Hectical fevers: *Ale-coſt* or *Coſt-mary* (as ſweet as *Myrtle*) and *Ale-hoof*, or *Ground-Ivy*, famous for diſpatching the maturation of Ale and Beer, and as prompt in healing bruiſed wounds. The *Primroſes* and *Cowſlips* do now prove, what a ſpirit Bloſſoms do give: And of Bloſſoms the *Clove-gelliflower* is our chief.

Acute and Learned Writers do maintain it, that a good choice of Diet, duly order'd, is the ſureſt remedy againſt many of the moſt obſtinate maladies, and the beſt preſervative of firm health: And *Liquids* have a potent inſinuation, by their nearer affinity to our Blood, Humors and Spirits; without ſtraining Nature to the difficulty of Triture, or Colliquation of groſſer food: Which the ſtoutly Carnivorous can beſt perform, to ſupport their athletic ſtrength. And *Flora* freely offers to the Intelligent all her copious Wardrobes at hand, with infinite variety for all palates, humors, and occaſions. And thoſe who are afraid of breeding the Stone, and other tormenting and mortiferous diſeaſes, may calculate, how much more cheap, eaſie, and pleaſant it is, to drink moderately and ſeaſonably from a hogſhead of the beſt Cider of their own, than to pay large fees for uncertain Medicines at an after-game; or to live alwaies at the rate of haut-gouts. The ſame for the cleanſing, ſanative and reſtorative Diet of other Vegetables.

4. The

4. The Author gives good directions for the making or ordering of *Thea*, *ch.* 5. *Sect.* 9. *p.* 140, (which may instruct us for other like foliats,) and for making good *Chocolate*, *ib. p.* 139; which by art and mixtures may in time excel the famous *Thea*, being both Drink and Meat, when duly incrassated; healing, reviving, cherishing, and strengthening Nature. But racy *Canary*, and right *Redstrake* do disdain all mixtures: And in *Barbados*, they say as much for *Madera*. It were to be wished, that the Author *ch.* 5. *Sect.* 9. *p.* 140. had shewed the best way of making *Sherbet* (as he has done Chocolate and Thea; for *Sherbet* is an excellent beverage, in high esteem, and very proper for hot Countries; and especially for our Sugar-plantations; where they have Lemons, Limes, and all other materials and requisites: And also, where they have need to be minded, and supplied with more sober allayers of thirst, than their Flagrant *kill devil*.

Thus far I have adventured, too boldly, but with sincere respects to the obliging Author, and to the business, with a touch on the by. I am,

Sir,

Your, &c.

Eclipsis

Eclipsis Lunaris
Anno 1676, die 1. *Januarii* mane observata
G E D A N I
à Johanne Hevelio.

HAnc Eclipsin Lunæ cœlo admodum sereno observare obtigit, sic ut ipsum initium, *tum etiam* 12 *phases crescentes, ad maximam usque obscurationem ex voto deprehendere & describere licuerit; post maximum autem defectum nubes supervenêre, adeò ut non nisi duas phases decrescentes,* 14 *&* 15, *annotare, & quidem vix satis accuratè, potuerimus; exindeque* finem *etiam minimè conspeximus. Optandum quidem fuisset, cœlum continuò extitisse serenum, quò stellulam illam fixam, horâ* 4. 11'. 45". *à limbo Lunæ inferiori & orientali distantem, exactè observare licuisset; sed nubes pariter illam postea nobis eripuerunt. Quantum conjicere datur, si non à parte Australiori Lunæ omninò tecta est, haud procul tamen a limbo Lunæ inferiori incessit: Sed de hocce phænomeno alii, quibus cœlum magis fuit propitium, aliquid certius indicabunt. Notatu dignum in hâc Eclipsi præprimis extitit quòd penumbra ab hora statim* 2. 36'. 40". *inceperit. Nam eâ parte ad M.* Baronium, *&* Sinum Apollinis *eo tempore jam paulò obscurior Lunæ limbus videbatur; quæ penumbra deinde successive densior evasit, ita ut hor.* 3. 8'. *jam satis notabilis extiterit. Ipsum verò* initium *Eclipseos primùm horâ* 3. 30'. *hîc* Gedani *contigit; cùm tamen juxta calculum* Rudolphinum *fere* 16' *citiùs incidere debuisset. Pariter quantitas Eclipsis ad* integrum digitum *minor extitit, quàm calculus eam promiserat. Quippe non nisi* $3\frac{1}{2}$ *dig. obscurata, ut ut calculus eam* 4 *dig.* 25'. *ostenderit. Quæ discrepantia ut satis evidens est, sic Tabulas multâ adhuc correctione indigere ostendit. De cætero, in hâc Eclipsi quoque probè notandum est, quòd omnes Sectiones nunquam* Montem Porphyritem *omninò texerint, sed ille per totam durationem, etiam in ipsâ maximâ obscuratione, in ipso umbræ limbo conspicuus perstiterit: Deinde, quòd durante Eclipsi horâ* 3 46' *ingens halo Lunam cinxerit.*

Observatio

Obſervatio Eclipſ. Lunaris
Anno 1676, die 1. *Januarii* mane habita
G E D A N I.

Tempore ex Altitud. Correcto. Hor.	'	"	*Altitudines Fixarum.* °	'	"	*Nomina Fixarum.*	*Ordo Phaſium.*	*Per quas maculas tranſiverint Umbræ Sectiones.*
2	28	38	26.	12.	0	*Dextr. humeri Ori-* (*onis.*		
2	33	20	25.	35.	0	*Dextr. humer. Ori.*		
2	36	40				*Initium Penumbr.*		*Ad Montem Baronium.*
3	8	10						*Penumbra denſior.*
3	16	35						*Denſa penumbra.*
3	24	20						*Denſiſſima penumbra.*
3	30	0				*Initium Eclipſeos.*	1	*Ad Sinum Apollinis.*
3	36	25					2	*Per M. Alabaſt. & Sin. Hy-*
3	42	5					3	*Ad Sinum Apoll.* (*perbor.*
3	45	25					4	(*Majorem.*
3	46	30					5	*Per M. Baron & L. Nigr.*
3	52	10					6	*Per Inſ. Ophiuſam.* (*Min.*
3	59	15					7	*Ad M. Porphyr. & L. nigr.*
4	7	45				*Stellula diſtab. in*	8	*Per M. Porph. & M. Serr.*
4	11	45				*limb. 36' vel 40'.*	9	*--Porph. Pr. Dæ, & M. Carp.*
4	12	10						(*Macroceran.*
4	18	5					10	*Per Inſ Corſ. M. Arg. & M.*
4	26	0					11	*Per M. Porphyrit. & Lac.*
4	34	0					12	(*Traſimenum.*
4	43	20					13	
4	56	20					14	*Ad Sinum Apollinis, & M.*
5	3	0					15	*Chriſti, & Inſ. Macr.*
5	25	0						
5	30	0						
5	55	28	32.	33	0	*Lucidæ Lyræ.*		
5	57	33	32.	50.	0	*Lucidæ Lyræ.*		
5	59	0						*Penumbra.*
6	8	0						*Penumbra ponè evanuit, quoad conjicere potuimus ob nubes.*

An

I, & II. *Memoires pour servir à l'Histoire Naturelle des* ANIMAUX: *To which is joyned another Tract totally different, entituled,* La MESURE *de la* TERRE. *A* Paris, *de l'Imprimerie Royale,* 1671, *in fol.*

A Great part of these two Treatises having been already given an account of in *Numb.* 49. and 112. of these Tracts, as they there came to our hands; we shall now only take notice of what we could not do formerly, because there were not *then* described so many *Animals*, as there are now; and, as to the Account of the *New Measure of the Earth*, we then had it at the second hand in writing un-printed.

But before I descend to particulars, I think, it will not be amiss to acquaint the Readers (who will find it very difficult to get any Copies of these Books,) with part of the Introduction, premised by the Illustrious Authors to their Observations concerning the Animals examined by them; which examen they own to have made as they are a *Royal Academy* and Body, instituted by his Majesty of *France* for the Improvement of Sciences.

They say then, that that which they bear themselves most upon in these *Memoires*, (as they call them) is, the uncontroulable Testimony they give to a certain and known Truth. For they were not the work of one particular man, *who* may suffer himself to be prevented by his own opinion; *who* doth not easily apprehend but what confirms the first thoughts he hath entertain'd, for which he hath as great an indulgence, as a parent hath for his children; *who* is not contradicted in the liberty he gives himself to deliver whatever he shall judge capable to bring lustre to his work; and, in a word, *who* considers less the truth of matter of fact, than the fine dress, which he adds to it and forms himself, of certain particularities, which he supposes, or disguises, to make them serve his turn; insomuch that he would not be well pleased to learn such Truths and to make such Experiments as should ruine a fine-spun ratiocination. But such Inconveniencies, as these, *they say*, are not incident to these *Memoires*, which contain no matter of fact but such as hath been verified by a whole Assembly, composed of persons who have Eyes to see such things as these, otherwise than the greatest part of the rest of the world, and that have Hands to search into them with more dexterity and success; *who* see very

well what is, and who will hardly be made to see what is not; *who* do not study so much to find things new, as to examine those well that are pretended to *have been* found; and *to whom* the very assurance of having been deceived in some Observation, gives little less satisfaction, than a curious and important Discovery: So much, (*they assure us*) doth the Love of certainty prevail above any other thing. Now this Love, (they add) is so much the stronger, as it meets with no combat from any other interest; forasmuch as the vain glory, which the success of an ingenious illusion might by a surprize have carried away, would be to them a very small thing, it being divided between so many persons that do all contribute to this work, *either* by the propositions that each of them makes of new things which he discovers, *or* by his clearing up of the Discoveries made by others, in examining them as others do examine his, with such a watchful care as a little emulation never fails to stir up amongst Philosophers: So that, in all appearance, such matters as have passed so strict a trial as these, are exempt from all deceit and falsity.

Having thus introduced their labours, and intimated withal, that they have chiefly given an account of the *Internal* parts of the Animals here exhibited, now and then only adding some Reflexions upon particularities that might deserve them, yet no otherwise than an Essay, and the First fruits of that Crop, that one day may be reaped from a whole Magazeen of such Observations: Having, I say, done this, they give us the Anatomical Descriptions themselves of 13 species of Exotic Animals; of which Five (*viz. a Cameleon, Castor, Dromedary, Bear,* and *Gazelle,*) were formerly published, and described by the same Persons, in a Book in *quarto*, printed at *Paris* 1669; which now are reprinted here in a more magnificent manner, and augmented with the number of *Eight* species, which are, two *Lions* and a *Lionness*, a *Chat Pard* (supposed to be engendred by a Leopard and a Sow-catt,) a *Sea-fox*, a *Lupus Cervarius* or *Lynx*, an *Otter*, a *Civet cat*, an *Elke*, and a *Coati Mondi* of *Brasil*.

First, they discourse of *two Lions* and *one Lionness*; and, among other observations, they take notice from divers circumstances, that one of the two Male-Lions sickned of a Surfet; they having been inform'd, that some months before he died he would not only not come out of his lodge, but hardly eat; and that therefore some remedies

remedies were order'd for him, and among the reſt, not to eat any other fleſh but that of young Animals, and to eat them alive. To which his Keepers (to render this food the more delicate for him) added the extraordinary preparation of fleaing Lambs alive, and to let him eat divers of thoſe; which at firſt recover'd him, by reſtoring his appetite and ſome chearfulneſs. But yet, *ſay they*, this food in all appearance bred too much blood, and ſuch as was too ſubtile for this Animal, to which Nature hath not given the induſtry or care of fleaing thoſe Creatures it feeds on; it being credible, that the hair, wool, feathers and ſhells, which all Animals of prey devour, are a kind of neceſſary correctif to keep them from filling themſelves by their greedineſs with too ſucculent a food.

Next, comes the *Chat-Pard*, wherein they chiefly note the defect of Spermatick veſſels, and of other parts abſolutely neceſſary to generation, which they found did not proceed from caſtration, but from ſome other cauſe: Where they take occaſion to obſerve, that the Sterility, which is ordinary in ſome of thoſe Animals that are born of two different *ſpecies*, muſt have in *this* ſubject a very particular cauſe. For, *ſay they*, that which renders *Mules* ſterile, is not the defect of any of the Organs neceſſary to generation, in regard that the difference which may be found in the conformation of the *matrix* of a Mare and of that of a She-Aſſe cannot, as ſome pretend, be a ground of this cauſe of ſterility; the Mare, in which ſomething is deficient that is found in the She-Aſſe, not being deſtitute of any of the parts abſolutely neceſſary to engender, becauſe it doth engender; and the difference of the organs being not the cauſe of barrenneſs, foraſmuch as the difference of organs, which is between the ſpecies of Horſes and Aſſes, hinders not the breeding of Mules, which do iſſue from the mixture of thoſe two *ſpecies*. Whence *Ariſtotle*, following *Empedocles*, imputes this defect only to the Temperament of thoſe Animals, whoſe parts have contracted a hardneſs that renders them incapable to contribute to a new mixture: So that, if it be true, that moſt of the Animals, which are born of the mixture of two kinds, are notwithſtanding fruitful, they are inclined to believe, that the conformation of this *Chat-Pard* was peculiar and accidental, and that the defect of the parts which it wanted, and which made it uncapable of engendring, proceeded not from that mixture of ſpecies's, which by changing the

Conformation of the parts cannot ſo ſpoil the ſame as to render it unfit for the functions, and is yet leſs capable to make a Mutilation; but may more eaſily cauſe ſome vice in the Temperament, which is a very natural ſequel of mixture; and laſtly, that 'tis probable, that if the *Mule* be the only Animal, which the confuſion of *ſpecies* renders ſterile, there is ſomething particular in thoſe Animals that have engendred it, which is not found in others; and that is perhaps, as *Ariſtotle* thinks, the hardneſs of the *matrix* in Mares and Aſſes, which like an Earth is rendred ſterile by drineſs; whereas that reaſon hath no place in Leopards, Foxes and others, which are Animals fecond enough to tranſmit to their off-ſpring the ſtrong diſpoſitions they have for generation, notwithſtanding the reſiſtance which the mixture of different *ſpecies*'s may bring.

The *Third* is the *Sea-Fox*, in whoſe ſtomach they found a branch of the Sea-herb *Varec*, and a Fiſh of five inches long, without its head, ſcales, skin and bowels, all having been conſumed, except the muſculous fleſh, which was yet entire. And as to its Guts, they obſerve, that the Upper part of them had a peculiar ſtructure, and, inſtead of the ordinary circumvolutions of Guts, the cavity of theſe was diſtinguiſh't by many tranſvers ſeparations, compoſed of the membrans of the Inteſtin turned inwards, which ſeparations were half an inch diſtant from one another, and turn'd helically like a Snail-ſhell; which may be taken for a cauſe that the food is ſtaied and a long while a paſſing, though the way be ſhort enough.

The *fourth* is the Female *Lynx*, which is one of the animals, that have ſhort Guts, of which kind the Lion is alſo one, whoſe Guts they found hardly longer than three times the length of his body: Which argues ſpeedy digeſtion and great voracity.

The *fifth* is the *Otter*, the difference of which from the *Caſtor* they have very carefully obſerved; as they have alſo the peculiar connexion of the *Spleen* of the *Otter*, which they ſay is different from that of almoſt all other animals, in which that *viſcus* is generally faſtned to the ſtomach, whereas in this Otter it was faſt to the *Epiploon*. And as to a *foramen ovale*, they found no appearance in this *Otter*, that it had ever had a hole that could give paſſage to the blood from the *vena cava* into the *arteria venoſa*; which, they ſay, agrees well enough with that remark, which all the Ancients have made, *viz.* that the *Otter* is conſtrain'd from time to time to

riſe

riſe above the water to breath; which a *Caſtor* doth not, as having a far greater facility to be a long while without reſpiration.

The *ſixth* is the *Civet-Cat*, which they were glad they had the opportunity to compare with a *Caſtor*, foraſmuch as thoſe two Animals agree in thoſe organs that are very peculiar to them, which are the receptacles wherein that liquor is collected that is ſo remarkable for its ſcent, but is very ſweet in the one, and very unpleaſing in the other. Which made them ſearch, whether there was not ſome particular reaſon of this diverſity of ſmell; but to them it appear'd not that there was any other cauſe than the diverſity of the Temperament of theſe Animals, the *Civet-Cat* being hot and dry, drinking little, and living in hot and dry Countries; but the *Caſtor*, living now in the Water, then upon the Earth, and being a very moiſt Creature, hath not heat enough to concoct and perfect its humidity.

They had, it ſeems, two of theſe Cats, a Male and a Female, which were ſo like one another outwardly, that there was not ſo much as any diſtinction of ſex that appeared; the Male, upon the diſſection, being found to have its genitals hid and ſhut up within, and the veſſel that contains the odoriferous liquor being altogether alike in both. Which veſſel is a pouch or ſack under the *anus*, not under the tail, as *Ariſtotle* puts it in his *Hyena* (which they make the ſame with the *Civet-Cat*,) and is different from the *matrix*; both very accurately deſcribed by them. As to the odoriferous liquor, they found it come forth, in the Male as well as the Female, out of a great number of glanduls that are between the two coats that compoſe the pouches, which were in the Male very large, and very ſmall in the Female; the Male yielding alſo a Civet more pleaſing than the Female, though Authors generally affirm the contrary. They found not, that the ſmell of the Civet becomes more perfect by being kept a while, nor that it is of an offenſive ſmell when new, as *Amat. Luſitanus* affirms; this ſmell not ſeeming to them better after a years time, than at the time of the diſſection.

The *ſeventh* is the *Elk*, of which they examine very ſolliciteuſly its *Claws*, together with the tradition of this Animals curing it ſelf of the Epilepſy (to which 'tis ſaid to be very ſubject) by putting one of his feet into his Ear; whence the Claw of that foot is alſo much celebrated among the *vulgar*, as a ſpecifick againſt that diſtemper. Of its *Brain* they take notice, that the *glandula*

pinealis

pinealis therein was of an extraordinary bigneſs, and conſider, that Lions, Bears, and other bold and fierce Animals have that part ſo very ſmall that 'tis hardly diſcernable, and that the ſame is exceeding big in thoſe that are very timorous, as the *Elk*; this Animal being eſteemed to be ſo fearful, that it even dies of fear when it hath received the ſlighteſt wound, it having been obſerv'd, that it never ſurvives when it ſeeth any of its own blood.

The *eighth* and laſt is the *Coati Mondi*, a *Braſilian* Animal, recorded by *Margravius*, *Laet*, and others, in whoſe books the deſcription of that Animal differs only in the deſcription here made of it, that in the former the Authors deſcribe not their *teeth*, which have a peculiar conformation, nor the *ſpurs* on their feet; and that they make the length of its *tail* much longer than the whole body; which in this *Coati* of our Authors, was but ſhort in compariſon; but may have been eaten off by the Animal it ſelf, foraſmuch as *De Laet* ſaith, that this kind of Creatures are wont to gnaw their *tail*, and ſometimes quite off; which when they do they die of it.

So much of one of theſe Treatiſes: The other, being a New and with great accurateneſs performed *Menſuration of the Earth*, hath been largely deſcribed, above a year ſince, in *Numb.* 112 of theſe Tracts, to which we ſhall refer the Curious Reader.

III. *BRITANNIA ANTIQUA Illuſtrata, or, The ANTIQUITIES of ANCIENT BRITAIN, derived from the* Phœnicians, &c. *The Firſt Volume: By* Aylett Sammes, *of Chriſt's Colledge in* Cambridge; *ſince, of the Inner Temple.* London, *printed by* Tho. Roycroft *for the* Author, 1676.

THE Learned and Curious Undertaker of this great Work hath endeavour'd, in this his Firſt Volume, to attribute, with the Worthy *Bochart*, the firſt diſcovery of *Britain* to the *Phœnicians*, and to make a *German* Nation, and not the *Gauls*, the firſt Planters of the ſame, and to impute that great agreement which was between the Ancient *Britains* and *Gauls*, in point of Language and Cuſtomes, not to their being originally the ſame People, but to the joynt entertainment of Commerce with the *Phœnicians*, the ancient and great Navigators throughout the World.

From this Commerce with the *Phœnicians* he doth with much probability deduce the Original Trade of this Iſland, the Names of Places, Offices, and Dignities, as alſo the Language, Manners, Idolatry,

Idolatry, and other Customes of the Primitive Inhabitants, illustrating many Old Monuments out of approved Greek and Latin Authors; and delivering withal a *Chronological History* of this Kingdom, from the first Traditional Beginning, until the Year of our Lord 800, when the Name of *Britain* was changed into that of *England*: All with great industry and care collected out of the best Authors that could give light herein, and disposed in a better Method than hitherto; together with the Antiquities of the *Saxons* as well as *Phœnicians*, *Greeks* and *Romans*. Before all which is prefixed a Curious *Map* of the Ancient World, representing to us, as 'twere in one view, the Progress of the *Phœnicians* in their remote voyages, and the Countries which they discover'd, together with the Names by them imposed on them; of all which particulars a large explication is subjoyned.

To observe some of the things that are most futable with the Nature of these Tracts; I shall first take notice of that Inquiry, Whether *Britain* was ever part of the Continent? Which he answers by enervating the Arguments that have been hitherto alledged by flourishing Authors; among which he examines that with most sollicitude, which from the likeness of the Soil concludes a Conjunction of Earth; and shews, that in truth it was nothing more but the same Vein of ground which ran *under water* from one Country to another; which he illustrates and confirms from Philosophical Considerations.

Secondly, I shall take notice of the most ancient Philosophical Order of people in *Britain*, the *Bards*, a *Phœnician* appellation of men, who in Poetical strains were wont to sing not only of the Praises of the Gods, the Essence and Immortality of the Soul, the Vertues of Great Men, but also of the Works of Nature, the Course of Cœlestial Bodies, and the Order and Harmony of the Sphæres; though afterwards by their degeneracy they gave the advantage to the *Druids* to get the upper hand of them; who yet notwithstanding, did not abolish all the Customes and Doctrines of the *Bards*, but retained the most useful parts of them, of which that of the *Immortality of the Soul* was one; to which they added the Souls *Transmigration*, according to the opinion of *Pythagoras*; about whose time, or a little after, 'tis believed that the *Greeks* entered this Island. These *Druids* had, after the *Bards*, a government that was universal over the whole Country, as well in Civil affairs,

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as in Religion; and they were exempt both from the services of War, and from paying any Taxes; by which Immunities many were invited to enter themselves into that Order and Discipline. What it is, that engaged them to have the *Oak* in so great veneration, is not so easie to determine. It seems, this Order of men was in so great reputation, that the *Gauls*, though they had themselves *Druids* in their Country, yet sent their Children into *Britain*, to be instructed in the Mysteries of the *Druids* here.

Thirdly, I cannot pass-by the Observation, which our Author maketh, *p.* 419. *& seq. viz.* That, as the *Britains* were originally a Branch of that Nation, *vid.* the *Cimbri*, a people of *Germany*, who anciently came and seated themselves in *Britain*; so the *Saxons*, that were invited hither after a revolution of so many Ages from that time, were a true branch of those very *Cimbri*, that had seated themselves so long ago before them in this Island. Nor need it to be wonder'd, that, if the Ancient *Britains*, and the later *Saxons* be derived from the same stock (the *Cimbri*,) they should understand nothing of each others language at the *Saxons* entrance: For, the continuance of Time, and the mixture of the *Britains* with the *Phœnicians*, *Græcians*, *Gauls* and *Romans*, in several ages, was the cause of that difference; though it is not to be doubted but that there are many words in the *British* tongue which agree with the *Saxon*, and which in probability they had in use long before the arrival of the *Saxons* themselves.

Errata in *Numb.* 123.

P. 551. l. 1. r. *Beginning the Twelfth year*, for *Eleventh*; which was an unhappy oversight, ibid. l. 15. r. *Archimedis*, ib. l. 23. r. *Vinetum*; p. 552. l. 25. *place*, add, *or Country where they were born or educated*; p. 553. l. 4. for *remote* r. *Roman*, ib. l. 14. r. *Forests in Germany*, ib. l. 26. r. *our Jeackson*, ; p. 554. l. 15. r. *more intricate*, ib. l. 24 r. *Boscage* for *Biscay*, ib. l. 25. r. *apart from*, ib. l. 32. r. *who have recorded*; p. 556. l. 9. r. *Wheel-barometer*, ib. l. 22. r. *envy in us*; p. 564. l. 31. r. *à Secretis*; p. 574. l. 4 r. *Vinetum*.

Err. in *this Numb.*
Pag. 590. l. penult. r. *penè evanuit.*

Printed by *T. R.* for *John Martyn*, Printer to the *Royal Society* at the *Bell* in St. *Paul's Church-Yard.*

PHILOSOPHICAL TRANSACTIONS.

May 22. 1676.

The CONTENTS.

Two Instances of something very remarkable in Shining Flesh, *from Dr.* J. Beal. *A Discourse concerning the* Spiral, *instead of the hitherto supposed* Annular, *structure of the Fibres of the Intestins; discover'd and shewn by Dr.* William Cole *to the* R. Society. *Monsieur* Bullialdus *and Monsieur* Richelt's *account of the Lunar Eclipse of* Januar. 1. 1676. St. novo. *An Account of five Books: I.* Nic. Mercatoris *INSTITUTIONUM ASTRONOMICARUM Libri duo*, &c. *II. Observations sur les EAUX MINERALES de plusieurs Provinces de* France, *faites en l'*Academie Royale *des Sciences à* Paris *par le Sieur* du Clos, *&c. III. COCHLEARIA CURIOSA, written in Latin by Dr.* Molimbrochius, *and English'd by Dr.* Sherly. *IV. Two Treatises; the one, Medical, of the GOUT, by* Herman Buschof; *the other, partly Chirurgical, partly Medical, concerning some Extraordinary* Cases of Women in travel, *and some other uncommon Cases of Diseases in both Sexes, by* Henry van Roonhuyse: *English'd out of Dutch. V. New and Curious Observations of the Art of curing the* Venereal Disease: *English'd out of French by Dr.* Walt. Harrys.

Two Instances of something Remarkable in Shining Flesh, *from Dr.* J. Beal *of* Yeavel *in* Somersetshire, *in a Letter to the Publisher.*

SIR,

AFter you have been tired with the noise of a piece of Fresh Beef, which shined in the *Strand* in *London*, within few hours after it was bought in the Market; it may seem superfluous, or tedious, to discourse more of such matters. But for something, which I have not seen formerly remarked, and which fell out in this Town, and in the House where I dwell, within my own knowledg, I shall give you the Instances, as briefly as I can.

1. Upon Friday (*Febr.* 25. 1675.) a Woman of this Town, bought in the Market a Neck of *Veal*, which seemed well coloured, and well conditioned in every respect: The Calf, a cow-calf, was killed in the evening the day before; it was hung to a Shelf in a little Chamber, where she and her Husband lay: Upon the following Saturday, about 9 in the night, the Neck of Veal shined so bright, that it did put the Woman into a great affrightment. She calls up her Husband; he hastens to the Light, as fearing fire and flames, and seeing the light come only from the Flesh, he caught the Flesh in his left hand, and beat it with his right hand, as endeavouring to extinguish the flame, but without effect. The Flesh shined as much, if not more, than before, and his hand, with which he did beat the Flesh, became all in a flame, as bright, and vivid, as the Flesh of the Veal was, and so it continued, whilst he went from place to place, shewing it to others. Then he thrusts his blazing hand into a pail of pure water; this could not extinguish the flame at all, but his hand shined through the water: at last he took a napkin, and wiped his hand, till he wiped off all the Light. The next day (being *Febr.* 27.) the Veal was dressed, and some of the Neighbours, who saw it shining, were invited to eat of it; all esteemed it as good, as any they had eaten. A part of it was kept for *Febr.* 28, and 29. in which time it lost nothing of its sweetness. Other circumstances I omit for brevity.

2. And now I want not a parallel in consort for that part of this Relation, which seemeth strangest: For on Tuesday (being *Apr.* 4. 1676.) a fat Pork was killed for my Family; within two days, the Guts, or (as some call them) the *Chitterlings*, and feet of the Pork were boyled, and after they were throughly cold, they were put, in due order, in souse-drink, or pickle, in a low room, on the North-side, which had little light at mid-day, and was very dark, as soon as night began. *Apr.* 8. all those parts of the guts, and the claws of the feet, which floated on the top of the pickle, began to shine, and the parts immersed under water gave no light; the light increased daily more and more in all the parts that floated. *Apr.* 13. the light seem'd as bright as the brightest Moon-shine; thus it continued to shine (but fainter and fainter, and in fewer parts) almost a week longer; for, being often tumbled up and down, by slow degrees all sunk into the pickle, and then all the light expired. Whilst the light was vivid, I caus'd a Maid-servant to rub one of her hands upon the shining part; after which, she came through three rooms, into

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the place where I ſate, between a great fire on one ſide, and a candle or two on a Table near at hand, on the other ſide; and in this place ſhe ſhew'd me her hand, all over ſhining, as bright as Moon-ſhine; one indeed ſtood between her hand and the fire, another between her and the candles. Thence I went into another room, where there was but a ſmall fire, and no candle, but (at that time) a little Moon-ſhine through a window, there the ſhining parts of her hand, or indeed her hand all over appear'd to me very bright flames. Then I cauſed ſome of the ſhining Pork to be brought into the ſame room, and examined, whether the pickle did not ſhine, and ſo might give the flaming tincture to the Maids hand; but by wiping the Pork diligently with a napkin, till it was perfectly dryed, we found, that the flame of the Pork was rather increaſed, (as we all thought) than diminiſhed. Then I deſired all the company, (whereof ſome were young children, which have the tendereſt touch) to try, whether the moſt flaming parts had any perceptible degree of tepidity; all agreed, that they could feel no warmth. But I continued to direct them all to compare the dark parts with the moſt luminous, by that part of their fore-fingers, which hath the moſt tender perception; after 3 or 4 trials, all agreed ſtill, that all parts of the Pork were manifeſtly gelid; but ſome thought, they perceived the luminous parts leſs gelid than the dark parts, others denied it: for my own part, I found not ſo much difference, as could clear me from ſuſpecting a prepondering fancy. After theſe Tryals, the Maid wiped off the light from her hand, by rubbing her hand ſtrongly with a napkin, three or four times over.

3. Then I ſuffer'd my Servants to call in ſeveral Neighbours to ſee it, night after night, and particularly the Mother and Siſter of the Woman, which had the ſhining Veal. This I did partly to prevent, that they might not raiſe ſtories of Ghoſts in my Houſe; yet ſome were forward at it. If we had had a mind to act Pageantries, or to ſpread a ſtory of Goblins, you ſee how eaſily it might have been done, by ſmearing ones hands and face all over with the tincture of light, which adhered ſo permanently. And beſides, I noted, that by this acquired blaze, the face and hands would appear a great deal larger than they were, and the manner how it was done being concealed, the learned and ingenious might be at a loſs to diſcover what it might be.

4. If others think fit to vilifie theſe Obſervations, yet I muſt acknowledg, That I never heard nor read of the like, till Honourable

Mr. *Boyle* was pleas'd to oblige us with an accurate accompt of a Neck of Veal, and a Pullet, which were luminous, as you have publiſhed it in *N.* 89 of your Tracts, *p.* 5107. Hiſtories report of a ſuddain and ſhort fulgor about the countenance of the *living*, which they interpreted to preſage ſomething extraordinary, by which thoſe perſons became Illuſtrious; but of *dead carkaſſes*, which became thus luminous, I have read nothing in old Records. That Mackrels, in their pickle, did caſt a ſhining blaze, ſome days before they were ill taſted, or ill ſented, I gave you notice of *May* 5. 1665. as 'tis in your *Firſt Vol. n.* 13. *p.* 226. Since which time I tryed often to obtain the like, but without ſucceſs, though I know not what circumſtance was wanting. The pickle in which the Pork was put, was made only of pure Water, Bran, and bay-Salt, and was far from ſhining: It quencht the light by degrees of the ſhining Fleſh. The Mackrel-pickle (which was boyl'd with a mixture of ſweet herbs) by a little ſtirring became ſo luminous, that a drop of it in the palms of childrens hands appeared as broad as a ſhilling, or broader, ſo that a waſh of it might too fitly ſerve for Impoſture.

5. For the difficulty of obtaining the ſame, and for many other conſiderables, I refer to Mr. *Boyle*'s Pneumatical Experiment 37. by him obſerv'd about 18 years ago. And I think, ſhining *Worms* are ſeldom found in Oyſters, as was obſerv'd by Monſieur *Auzout*, in your *n.* 12. *p.* 203. And perhaps one may wait a long day, before he ſhall ſee ſuch a long-laſting Light in the *Iriſh* Seas, as was remarked in your *Vol.* 9. *n.* 111. *p.* 240. So that I cannot wonder, if expert Chymiſts do by ſome Chance obtain more, than by Art and much diligence they can repeat again, ſince they deal with ſuch fickle agents, as Fire and Flame. I have heard of ſome Dews on Meadows, ſhining in the early morning, before day-light; but thoſe more frequently. Theſe and much better, ſome of Mr. *Boyle*'s Inſtances in your forementioned *Experiment* 37. and more in his Diſcourſe of Luminous Gems at the end of his elaborate *Treatiſe of Colors*, may, at leaſt, by reſemblances, inſtruct us to apprehend the nature of ſome ſhining Meteors among the Clouds, or in our lower Region, of which, they ſay, ſome have a ſinging heat, and do blaſt, and that ſome are to the touch gelid, yet do poyſon or corrupt our fleſh. And I have read in our Chronicles, That in *England*, for many days together, there hath been a fiery incaleſcence with light, as if all the air had been in a flame. Thus we have flaming Air, and flaming

ming Water, in Seas, and in Clouds, and in Pickle; yet not so frequent, as to escape always the suspicion of being Prodigies. But in the foresaid references more is said of Light, than I am able to express; I shall only add, That I gave full warning to observe, whether the Light in my two Instances had any blewish or greenish tincture; all that saw both, affirmed the Light to be as clear as the brightest Moon-shine, and so it appeared to my own eyes; and I can perfectly remember, that I really thought the beams which came from the Mackrel, and the stirred pickle, to be bright Moonshine, till a Servant brought me to the Vessel, to see the contrary.

Postscript. We had the report here (whether true or false, you may best know) of the shining Beef in the *Strand*, about the same time, when the Neck of Veal, first mention'd, shined here. And it was here observed, That the Stars had that night a glaring brightness and largeness, more than ordinary, and for some moneths before, and ever since, the weather hath been more gentle, warm, and dry, than is usual in those months; but 'tis above my skill to demonstrate, how this belongs to the matter in hand. Note, that the Mackrel-pickle was thick and not transparent, till it was stirred and flaming; the Pork-pickle was clear, or transparent, yet shined not in any part.

A Discourse concerning the Spiral, *instead of the supposed* Annular, *structure of the Fibres of the Intestins; discover'd and shewn by the Learn'd and Inquisitive Dr.* William Cole *to the* R. Society.

Discoursing (near two years since) with a very ingenious Person, concerning the Mechanical reason of the *Peristaltick* motion of the Intestines, which is by Anatomists deduced principally from *Annular* fibres, constituting, according to the received doctrine (with the right fibres immediately investing them, though, by the by, I take these to make a distinct coat) one of the coats of them; his sence was (which he told me was that likewise of some others of his acquaintance) that they might be rather numerous, though small, Sphincter-muscles, than single fibres, to which that motion is to be attributed; Muscles being in most, if not all, other instances owned to be the adequate instruments of motions analogous to this; and fibres, though absolutely necessary, yet being no otherwise so, than as (a number of them being collected, and fitly disposed) they constitute a Muscle.

The Conjecture seemed to me more probable than the vulgarly received

received opinion: but yet (with all respect to the abettors of either) several difficulties occurred to me, whether of the two suppositions soever were allowed.

For, *first*, I conceived it might be doubted (each of these, whether single fibres, or muscles, being supposed distinct, as I think they generally are, and, if annular, I conceive, must be) how the actuating matter, or impression (according to the opinion of some learned men) should be transmitted from one to another down along the whole tract of the Intestines; since Natures usual way, for the propagation of Animal motion, is by a Continuation of vessels, (or at least fibres, whether they be concave or not) from the part where it begins to that to which 'tis imparted, either for the conveyance of some actuating substance, or (according to the other *Hypothesis*) the communicating an impression. But there being, in the *Annular* supposition, no such continuation of vessels or fibres, a lateral contiguity being all that can be pretended, it might perhaps be urged, that the influent and moving matter (according to that notion) might be transmitted by mutual inosculations between the contiguous fibres along their sides; which, if there be no Communication by vessels, was the only way, I could ghess at, to solve the doubt; for, the notion of an *Impression* would hardly do the business, since it seemed not evident, that there could be, in that supposition of a Continuity of fibres, tensity enough in the Intestins to carry on such a motion. But to this I considered,

Secondly, That such a supposition seemed not very agreeable to Natures methods, which ordinarily makes use of Vessels (and those both close, and as direct as the design and organization of the part will bear,) for the transmission of the fluid substances in the bodies of animals, not lateral emissaries; except where some great inconvenience is designed to be prevented by the help of such conveyances; as, for instance, by the Anastomoses, discovered to be between veins and veins, arteries and arteries, in which vessels the bloud running with a large and rapid stream, should any of them chance to be obstructed, the Circulation, so necessary to life, must needs be intercepted, without some lateral conveyance of it into others of the same kind: Which inconvenience yet I supposed would hardly be alledged in the present case; *that* fabrick of those vessels seeming to be designed for extraordinary emergencies, but *these* being, according to the present supposition, the constant and necessary ducts of this actuating matter. But nevertheless, *Thirdly*,

Thirdly, It ſeemed difficult (to me at leaſt) to ſolve this Inteſtinal contraction, though theſe lateral apertures were ſuppoſed: For, if fibres (whether conſidered as ſingle, or as conſtituting a muſcle) be contracted according to their length from ſome influent matter, it muſt be (according to my ſence) from a diſtenſion of them in breadth; and, in order to that, this matter muſt undergo ſome confinement in the part to be diſtended; but if they have lateral perforations (and thoſe in the oppoſite part proportionate to thoſe in that which admits this matter, which muſt, I conceive, be granted, ſince the contraction is all along the Inteſtines proportionate,) how can it be ſuppoſed, a diſtenſion (at leaſt ſuch a one as is here required) can happen, when the matter deſigned to effect it has ſo ready a paſſage forth, eſpecially its determination from the impelling cauſe being in right lines downward? If it were objected, that the motion of this ſubſtance might be ſuppoſed to be lateral as well as direct, in regard there would be a paſſage for it into the fibres as well as through the Anaſtomoſes, and that in proportion larger than through theſe, whence nothing ſeems to hinder but that a diſtenſion of them might follow; I ſuppoſed, it might be replyed, that, by reaſon of ſuch a diſtorſion of part of the impelled matter, it ſeems, that the impreſſed motion would be ſoon loſt (according to the laws of motion) unleſs the impelling cauſe were more violent than I ſee reaſon in this caſe to imagine it to be. But indeed I think, no Anatomiſts have obſerved, that muſcles (ſuppoſing theſe ſuch) receive their actuating matter in at their ſides, or, when their motion ceaſes, ſend it forth that way; but all, ſo far as has been obſerved, are fenced with a conſiderably compact, and (comparatively) impervious membrane.

Fourthly, I conſidered, that all muſcles are obſerved to have two tendons, one at each extremity, by the approach of one whereof toward the other, its motion, which is contraction, is performed; but it ſeems hard to conceive, that theſe tendons ſhould coincide (as in this ſuppoſition they muſt) and, if they do, I preſumed it would be difficult to determine, what part of theſe circular muſcles (if ſuch) the tendons are, and where the motion ſhould begin in each; it being obſerved, that all muſcles are faſtned to ſome, either ſimply or comparatively, unmovable part, toward which (ordinarily) they move, and by which the inſtinct of motion is from the nerves conveyed to them: But no Anatomiſts, (ſo far as I had obſerved) having diſcovered, that any one part of

these muscles, or moving *fibres*, whichsoever they be, has any stricter cohesion than other with any of the adjacent parts, I conceived, I might be allow'd the liberty to doubt of the *Hypothesis*, especially if I could satisfie my self better by another.

For instead of these solutions there occurred to my thoughts a third way, which (provided experience would countenance it) seemed more mechanically adjusted to solve the *Phænomenon*; *viz.* That those *fibres*, which have been esteemed *annular*, might perhaps be *spiral*, and so be continued down in one tract to the lowest extremity of the intestines; withal, that their smalness, compared with the compass they fetch about the intestine, might very easily, I conceived, impose upon any, who made not those reflections, or tried not to unravel them; their declination being, for that reason, not easily discernible: Which if true, it seemed probable to me, that when either a bare motion shall be impressed on them at their beginning, or any substance impelled into them, they being to be supposed *in statu naturali* moderatly tense, so long as the moving cause continues, the motion must be successively continued all along their tracts, and, that being in *ambitum*, must therefore, whilst it lasts, by abbreviating these *fibres*, straiten the intestine, and so thrust forward what is contained in it, especially if they proved to have a muscular fabrick. The conjecture as 'twas not disrelished by the person to whom I proposed it, so gratified me the more for the seeming easiness of the performance; Nature's operations being the most easy and simple that can be imagined, though for that reason very often, I doubt, overlook'd. But the notion lay afterward long *dormant*, till, about half a year since, being revived by I know not what occasion, I consider'd 'twas too unphilosophical to acquiesce in bare speculation, when *autopsy* might be consulted; and therefore I set upon the experiment, which I first made in a portion in the upper intestines of an Ox, which, by reason of their largeness of proportion to those of most other *species* of animals, seem'd fittest for the tryal; afterwards in those of Sheep and Calves, beside the repetition of it in Oxen, and not only in the smaller intestines, but in the *colon* and *cæcum* also. The circumstances and result of which tryals are as follows.

To effect a due disjunction of the membranes and *fibres* (which I found 'twas hard, if not impossible, for me to make while 'twas raw,) I was fain to cause the intestine of Oxen to be boiled 5 or 6 hours, of Sheep 4; whereby the compages of the parts was so

loosned,

looſned, that the two outward coats, *viz.* the common one, and that conſiſting of right *fibres* were eaſily ſeparated (if it were attempted ſoon after it was taken out of the water) from that to which my ſearch was deſtined, and left thoſe reputed *annular* ones naked; (though, by the way, too long coction would prove prejudicial on the other hand, by too much intenerating the *fibres*.) Theſe at the top of the inteſtine I attempted to ſeparate from one another; and when thoſe, which had been decurtated by the unequal cutting of the knife, were taken off, I found,

Firſt, that I could not ſeparate a ſingle *fibre* from his fellows to any conſiderable diſtance, all of them (to my obſervation) being very ſmall, and in the ſeparation running ſmaller and ſmaller, and withal by reaſon of their implication or ſtricter coheſion one with another eaſily breaking; but a congeries of them (to be obſerved eſpecially, though not preciſely alwaies, in thoſe places, where by gently extending the inteſtines ſeveral times, and then letting it return again, the coheſion of the ſeveral *ſeries* of them became looſned) which at firſt view would reſemble a pretty large *fibre*, would without much difficulty riſe together; the very ſmall conſtituting *fibres* of which cluſters yet, if the boiling had been very long continued, whereby the compages was very much relaxed, would in the raiſing be very apt to ſeparate from one another, and appear diſtinct, by reaſon of their inſertions, by and by to be mentioned.

Secondly, that when, beginning at the top, I attempted the ſeparation of one of theſe (ſuppoſed *annular*) cluſters of *fibres* towards my right hand (on that ſide of the inteſtine, I mean, which was turned towards me) a whole ring would come off together, (excepting that ſome *fibrillæ*, which, riſing from contrary parts, decuſſated one another at the top in that *phaſis*, would a little retain it) which at firſt ſtagger'd me as to my forementioned conjecture; but endeavouring it towards my left, I found, for the moſt part, I could eaſily enough unravel that cluſter to a conſiderable length, *viz.* that of ſometimes more than two or three ſpans, before ruption (of the whole cluſter I mean,) which yet at laſt 'twould be ſubject to. For,

Thirdly, though thoſe convolutions, as to the greateſt part of them appeared diſtinct, yet I found, that from every one of them at ſhort diſtances ſome *fibres* did obliquely, and the moſt of them, to my beſt obſervation, according to the courſe of thoſe I have mentioned, inſert themſelves into the next convolution, and become a part of it; though withal ſome I obſerved to have a contrary ten-

dency, or rather seem'd to ascend from the lower to the upper convolution, and help to constitute it, and so to observe the course mentioned; nay, sometimes would go farther than the next convolution, and, running under it, apply themselves obliquely to some higher, which yet being in a smaller number than the rest that lay in the order contrary to them, did not very much hinder the dissociation of the main ones: which *fibres* breaking off, and that in some places in greater numbers than in others, would at last (and the sooner if the intestine began to grow dry, which 'twould quickly do) cause the whole cluster to break off.

Fourthly, I observed, that as the most of these *fibres* would by degrees according to the order of the convolutions, insert themselves into the next, so some of them would (in the same order) pass over it, and more (so far as I have observed) would run under it, and either adjoyn themselves to some more remote, or elude my searching by hiding themselves under them. This insertion of these *fibres* seems to be the reason of the *annular phasis*, that I mentioned even now, in the contrary way of separation: For, the attempting it contrary to their order, must hinder in some measure the ready dissociation of the next convolutions upwards; especially near the severed extremity, where there is less resistance of the adjacent parts; the mentioned *fibres* also seeming somewhat bigger, and consequently stronger, in the upper, than after their insertion into the lower convolution: Though indeed

Fiftbly, I found, that if I began at a lower part of the intestine, and try'd to unravel *upwards*, there was not much more difficulty in so doing, than when beginning above, I attempted it *downwards*; of which the reason, I suppose, might be the tenderness of the part occasioned by long boiling, whereby I could not perhaps judg of the degrees of renitency in those small *fibres*. In this contrary way of separation too, the operation, I observ'd, would not succeed, unless I attempted it in the contrary order, *viz.* towards my right hand.

Sixthly, when before boiling I caused the inside of the intestine to be turned outward, as I did in two tryals, and afterward by taking off the glandulous and vascular coats (which I think to be distinct from one another, as I said before of those consisting of right *fibres*, and the supposed *annular* ones,) endeavoured to unravel the *fibres*, I found they would come off in the contrary order, *viz.* from my left hand toward my right; which, I conceive, confirms the observation above deliver'd, in regard the intestine being inverted, the order of separation must be so too; though I found

found(or thought) the operation more difficult, by reaſon of ſome *fibres* lying in the oppoſite order (mentioned under the third particular) and in this appearance lying uppermoſt.

Seventhly, in one of theſe attempts of unravelling the *fibres* of the inteſtine of an Ox, ſo inverted, I found, that though the *fibres* I took up came off in the order I juſt now mentioned, yet running over ſome others, they made a more oblique excurſion, and for two or three convolutions left betwixt them a conſiderable *area* of *fibres*, amounting (according to my conjecture) to five or ſix times, or more, the bredth of thoſe that ſo came off, till going deeper and deeper among the other *fibres*, and at laſt running under them, they could be no longer traced, but brake off. Whether this be uſual, or only *luſus naturæ*, I cannot determine.

Eighthly, I found it much more difficult (in that one tryal I made) to unravel the *fibres* of the *Cæcum*, than the other inteſtine, which ſeemed more interwoven than thoſe of the reſt, and to have contrary tendencies one among another.

This is the ſum of my obſervations hitherto concerning this coat, which I take leave to think one concave and Helical muſcle (if I may ſo ſtyle it:) And that it might be ſuppoſed ſuch, the forementioned inſertions ſeem'd to evidence, they appearing to me in the ſeparating appoſitely enough to repreſent the fabrick of a muſcle delivered by the accurate *Steno*. Where the tendons of it are fixed, is not evident; but, if I may have the liberty to conjecture, I ſhould think the upper of them to be radicated (at leaſt) at the *pylorus* (if not as high as the *ſphincter gulæ* (if this be not it,) ſince, the carneous coat of the ſtomach being by the Learned Dr. *Willis* found to be a muſcular contexture, and there being a continuation of motion between that part and the inteſtines, it ſeems to me not altogether improbable they may be but one muſcle; and the *other* at the *anus*.

Whether the ſuppoſed *annular fibres* of the *veins* and *arteries* may not have the ſame fabrick as thoſe of the *Inteſtines*, ſince both theſe kinds of veſſels ſeem to have a *periſtaltick* contraction of their own, and not to be bare conduit-pipes to tranſmit the impelled bloud, I propoſe to be conſidered and examined by perſons of more acute hands and judgment; as I do all what I have here delivered, not daring too much to truſt even the informations of my own hands and eyes, till I find them confirmed by thoſe of others, more judicious as well as dextrous in making experiments.

Monsieur *Bullialdus* and M. *Richelts* account of the last Lunar Eclipse of *Januar.* 1. 1676. St. novo; whereby it appears that the *Rudolphin* Tables or *Hecker's* calculus made thereon, do considerably differ from the Heavens both for duration and magnitude, but the *Philolaique* Tables, less.

Tabulæ Philolaicæ exhibent in Eclipsi visâ Januarii die 1 *mane*, 1676.

	Vraniburgi		*Parisiis*		*Decemb* 31. *St. novo.*
	H. ′ ″		H. ′ ″		
Initium	14. 53. 29		14. 13. 29		
Max. obsc.	16. 0. 33		15. 20. 33	Digitos III. LI.	
& Veram	16. 9. 18		15. 29. 18		
Finem.	17. 7. 37		16. 27. 37.		

Sic vero illud deliquium observavit Ismael Bullialdus,

Capellæ Dist. à vertice. Parisiis manè

G. ′		H. ′ ″
39 36	Penumbra tenuis.	2 6 12
40 42	Penumb. crassior.	2 12 7
41 48	Obscurior adhuc.	
42 30	Initium sensibile è reg. sinus Hyperb. circa gr. 70.	2 23 32
42 50	Digiti fere 1/8	2 25 48
44 25	Umbra attigit Atlantem minorem.	2 36 11
47 28	Umbra paulo supra Baronisum, supra Liguſtinum, occupaverat Macr. M.	2 56 27
48 56	U. attigerat fere catenam Mundi.	3 6 20
49 54	U. attig. Montunial.	3 12 54
50 30	Attigit sinum Perontic. Montem Pyram. & med. paludum Hyperbor.	3 17 51
52 7	Occupavit sinum Sagaricum & Peronticum, atque Promont. Lunæ.	3 29 1
54 52	Leucopetra extra umbram.	3 48 21
55 40	Sinus peronticus extra umbram.	3 54 6
55 48	Sinus Sagaricus extra umbram.	3 55 12
56 17	Sinus Cercinites fere emersérat.	3 58 29
57 16	Pars sub umb. æqualis fere latitudini Paludis Mæotidis.	4 5 38
58 30	Finis verus è reg. Mont. Macrocem. circa g. 355.	4 13 56
59 6	Penumbra.	

Corsicam non attigit umbra, neque Lacum Thrasymenum, propterea Eclipsis non excessit digitos III. XXX'. vel minus etiam.

Initium uno scrupulo primo vel 45″ *antecessit adnotatum, ita ut statui exactius possit H.* 14. '22. ″32. *Hinc tota duratio satis præcise H.* 1. 51. 24. *Quare maxima obscuratio contigit H.* 15. 18. 14.

Parisiis *observatum.*	H. ′ ″	Heckerus *Parisiis* H. ′ ″	
Initium	14 22 32	14 8 0	Totam durat. H. 2. '24. ″36.
Max. obsc.	15 18 14	15 20 18	Digitos. IV. '24.
Finis	16 13 56	16 32 36	″31.

Tabulæ ergo Rudolphinæ ostendunt durat. longiorem observatâ '33. ″13. *Magnitudin. deliquii majorem* '54 ″31. *unius digiti* '60, *id est, uno fere digito.*

Argentinæ *sic observ.* D. Julius Richelt *Professs. Mathematum, utcumque, ut ipse dicit, ob nondum absoluta correctiora instrumenta:*

Alto Arcturo G. ′	H. ′ ″	
30 30	14 48 48	Initium.
36 0	15 20 8	U. per Montem Porphyritem & Promount. Lunæ.
39 50	15 45 44	U. Strinxit Lacum Thrasymen. Mont. Baronisum & sinum Cercinitem.
44 15	16 13 20	U. transiit per Prom. Lunæ & Montem Cimmerium.
46 25	16 27 36	U. tetigit Lacum nigrum minorem & M. Carpathum.
48 30	16 41 44	Desiit in Regione Hyperborea media ad Mare Hyperboreum.

Tota duratio observata Argent. H. 1. '52. ″56. Merid. Parisiens. ab Argentoracensi distat 0. 22. ″48 ex fine.

Observationibus Londini *factis observatum est,*

	H. ′ ″	
Initium	14 16 0	Distat ex hac Eclipsi ad ortum meridianus Paris. a Londin. '6. ″38.
Max. obsc.	15 11 37	Qui ex observatione Eclipsis die vii.
Finis	16 7 15	Julii 1675 apparuit '10. ut etiam in
Tota dur.	1 51 15	Eclipsi xi. Januarii ejusdem anni.

An

I. *Nicolai Mercatoris Holsati, è* Soc. Regia, *INSTITUTIONUM ASTRONOMICARUM Libri duo, de MOTU ASTRORUM Communi & Proprio, secundùm HYPOTHESES Veterum & Recentiorum præcipuas; deq; Hypothesεωn ex Observatis constructione: cum TABULIS TYCHONIANIS Solaribus, Lunaribus, Lunæ-Solaribus, & RUDOLPHINIS, Solis, Fixarum, & quinq; Errantium, earumq; Usu, præceptis & exemplis commonstrato: subnexâ Appendice eorum, quæ novissimis temporibus cælitus innotuerunt.* Londini, 1676. *in* 8o.

THis Learned and Industrious Mathematician hath made it his business to comprehend in these *Institutions* the Sum and Substance of Astronomy: And although many Authors before him have done very worthily in treating of this Science, particularly *Mæstlinus, Keplerus, Ricciolo*, and *Gassendus*; yet hath He pursued several things differently from others, and *insisted* on such particulars, as he thought *most* pertinent to *his* purpose. For, besides the Representation of the main Use of both the Globes in divers considerable Problems, and the Trigonometrical Calculation employed in the doctrine of the Sphere; he hath with a peculiar diligence explained the matter of the *Equation of Time* in both the *Ptolomæan* and *Copernican* Systeme, as also the *Lunar* Hypothesis of *Tycho*, and the *Elliptical* of the Planets: Nor hath he been less solicitous in teaching the way of raising *Hypotheses* from *Observations*, and in delivering the *calculus* of the Celestial Motions from the most approv'd Tables: Explaining also with a not ordinary exactness the *Keplerian* Hypothesis of the Planets, and subjoyning thereto the Astronomical Hypotheses of *Ward*, *Bullialdus*, and *his own*, which last he esteems New, and according to which he teaches how to make a *calculus à priori*, comparing the same with good Observations. The whole he concludes with the exhibition of the late Discoveries made in the Heavens. So that it seems to be a work very useful for all Students of Astronomy, both laying the true foundation of this Science, and directing the Lovers thereof to those particulars, that may render them accomplished in the same.

II. Ob-

11. *Observations sur les EAUX MINERALES de plusieurs Provinces de* France, *faites en l'Academie Royale des Sciences, en l'annee* 1670, *&* 1671. *par le Sieur* du Clos, *Conseiller & Medecin ordinaire du Roy, de la dite Academie. A* Paris. 1675. *in* 12°.

THE *Royal Parisian Academy*, resolving to search into the Qualities of the most considerable *Mineral waters* of *France*, did not, it seems, proceed to this *examen* without great deliberation; the reasons of the Usefulness of these waters for the recovery of the Health of many sick persons, being ballanced by those of the difficulty of knowing the Causes of the proprieties of the said waters, depending particularly upon the mixtures of certain bodies they meet with in their passages through the Earth, and in the cavities or interstices of Rocks, and which are divers and very numerous, such as Vapors, Juyces, Salts, Earths, *&c.*

They were aware, that the greatest part of those matters, with which Mineral waters may be impregnated, are not discern'd in them, and that the different mixture which is made of many of them together, may constitute so many kinds of Mineral waters, salubrious or pernicious, that it seems impossible to know them all and to determine them. The Waters of the same Springs may, *say they*, at different times receive notable alterations by new mixtures, or by the cessation of those that were made before.

They think it not likely, that the Waters, called *Mineral*, are produced of the *sole Mineral Vapors* condensed, and that in the Earth there are Mines in that abundance as continually to furnish Vapors capable, when condensed, to entertain and feed the perpetual course of those waters in Springs that dry not up: But they Judge, that some *Mineral* Vapors or Exhalations mix themselves with the Common waters that traverse the Earth where they are, and are condensed, and that these waters remain impregnated with their qualities, and with some volatil Salts not concreted, elevated in those dry Exhalations, or in those moist Vapors.

They find, that the discerning of the Qualities of those Exhalations and Vapors is not easie; that the diversity of their matter is very great; that the occursion of their mixtures is casual; that the conditions of the places where they pass and where they are detained, are not manifest; and that the alterations which they produce in the waters, into which they insinuate themselves, are not always well known.

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They consider also, that there is no less difficulty in knowing and discerning the *Juyces* that may be mingled with the *Mineral* waters, and particularly those that receive no Concretion, and that do not communicate to these waters any *sensible* quality: For, those liquid and totally volatil Juyces do pass away in the distillation with the matter of the water, and do not manifest themselves but by such effects as *simple* water cannot produce.

They note further, that those Juyces which are called *Concrete*, because they are condensable and resoluble, leave sediments that render them visible and palpable after the distillation or evaporation of the water wherewith they are mixed; but that 'tis difficult to discern the species and proprieties of them, if they have not some resemblance with those that are known, or if there be many of them together.

As to *Salts* and *Earths*, they look upon them as the most sensible and the most common matters of those that are mixed in the waters of Fountains and Wells; so that there is almost no Earth which is not participant of some Salt dissoluble in the waters that pass through; and the current of those waters doth also carry always with it some fine and subtil Earth. But though these are the substances that are most manifest in these waters; yet they find, that the knowledge of these Salts and Earths mixed in the waters is not always so distinct as to enable us to determine the *species*, and to give a certain Judgement of their proprieties.

They observe further, that there are few Concrete Salts that are known to us; and that there may be many that have nothing like to *Common Salt*, *Nitre*, *Allom* and *Vitriol*, which are the four most vulgar of the concrete Mineral Salts. Those, whose disposition to concretion is not finish't, and which are yet embrionated and as 'twere in their seminality or first Being, are less knowable in that state; and those that are more formed and already concreted or capable of concretion, have not simple and homogeneous substances in each *species*.

The Salt, that is called *Common-Salt*, is observ'd to have two different portions mixed together; the *one* is condensed and crystallised by cold and in moisture, after the evaporation of a part of the water wherein this Salt hath been dissolved; the other will not be crystallised nor condensed but by a total evaporation of the rest of the water. The portion that's crystallised by cold and in moisture, is the most sulphureous, and by its sulphureity it will

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mixe it self with the sulphureous salt of calcined Tartar resolved in the moist Air, or in common water, without turbidness, and without coagulation: But that portion of this common salt, which is not condensed but by the total evaporation of the water that had dissolved it, hath an acidity that instantly coagulates the salt of Tartar resolved, and all other fixed Salts that are sulphureous and nitrous.

The *Vitriol*, which in a moist Air yields an efflorescence upon sulphureous marcasites, hath likewise a juicy portion, condensable only by the total evaporation of its aqueous humidity, and being of a very acrimonious taste, and of an unctuous consistence, and quickly resoluble in a moist Air; which juicy portion is very different from that which it condenseth first & crystallizeth by cold in the water where this vitriol hath been dissolved. These crystals are pure vitriol, acid-austere, of which much mineral earth precipitates by the mixture of sulphureous and nitrous salts, with which the other portion will mixe it self without turbidness, not having, like the former, that acidity upon which the sulphureous salts can work: Which is otherwise in common salt, of which the first portion is the most sulphureous, and the second the most acid.

True *Nitre* is likewise composed of two different saline portions; the one more sulphureous, which crystallizeth by cold, and in moisture; and the other, which remains dissolved after this crystallisation, and is not condensed but by a heat strong enough to expel all dissolutive humidity, is less sulphureous, and hath some acidity, which the other hath not.

The *first Beings* or *Embrions* of mineral salts are nothing but vapours, or juices not concreted, totally vaporable; of which some may be condensed and in part fixed by the action of fire, or disingaged from their matrixes; and made capable of concretion by means of the Air; which is observ'd in certain Nitrous, Aluminous & Vitriolique salts. The sulphureous salt wch is found in the lime of certain hard stones burnt in the fire, and which is a species of true Nitre, had its Seminal Being in those crude stones; and in that state of its first Being, it is very different from that which it acquires by the fire, which from Cold and Coagulative, changes it into Caustique and Resolutive. This cold and coagulative quality of this stony salt in its first Being, manifests it self enough in the waters of certain Rock-springs, which are very limpid and cold, and breed cold and scirrhous tumors under their throats that ordinarily drink

drink of them. The Seminal ſubſtance of ſtony Salt is made nitrous, ſulphureous, cauſtique and reſolutive by the fire, which was able to exalt it, but not able to produce it in calcining theſe ſtones, no more than that of burnt ſhels of Oyſters, of which alſo a lime is made, which hath not leſs of ſulphureous ſalt in it. This embrionated ſalt in lime-ſtones is a ſtony juice, which may mix it ſelf with the waters that paſs between the beds & interſtices of thoſe ſtones in the rocks, but which is not eaſily diſcerned in waters that are impregnated therewith.

The Seminal Being of *Allum* and that of *Vitriol* muſt alſo be in the matters from whence theſe ſpecies of Salts are extracted by the means of water, after their calcination in the Fire, and their maceration in the Air. The Fire and Air that have exalted them, could not produce them. Neither the ſeminal ſubſtance of Allum in Aluminous ſtones, nor that of Vitriol in ſulphureous marcaſites, are in that ſtate manifeſt to our ſenſes, and often they come not to be known in Mineral waters but by ſome effects, and that without certainty, becauſe thoſe may be equivocal.

All theſe varieties of Mineral ſalts, embrionate, form'd, cryſtallin, juicy, ſulphureous, non-ſulphureous, of the firſt and ſecond concretion; thoſe of their genus's, ſpecies's, mixtures, proportions, alterations, *&c.* render difficult and uncertain the judgment concerning the proprieties of the waters that partake of them.

Again, concerning thoſe *Subtile Earths*, which do alſo mixe themſelves in Mineral waters, they may alſo be of different ſorts, difficult to diſcern: Some of them are found of different colours, white, gray, yellowiſh, reddiſh, brown; and of different qualities, ſome being diſſoluble in diſtilled Vinegar, others indiſſoluble; ſome fuſible, others not fuſible by the fire, where they take ſeveral colours; ſome are marly, others argillaceous, others cretaceous; ſome bolar, ſome ſandy, ſome talky, ſome limy; others there are that are produced by the concretion of certain juices, ſaline or ſulphureous, others not; ſome are ſimply mineral, others metallique. Moſt of theſe ſorts not being eaſie to be diſcerned ſeparately, they will be leſs ſo when they are mixt with one another.

The ſimple infuſions of certain ſulphureous mineral Earths may notably alter the waters of Wells and Fountains, without having any thing of thoſe Earths remaining in their ſediments after diſtillation; in like manner as nothing is ſeen in certain liquours rendred vomitif by the ſole infuſion of Antimony.

The *hot* Mineral waters may contract ſome alteration from the ſulphureous and bituminous matters, which they meet with in their courſe; for theſe matters partake of certain ſubtil ſalts, which thoſe waters may reſolve and carry away with them.

Some *Cold* or *Tepid* mineral waters have a ſharpiſh or vinous taſte, which is not obſerved in any of thoſe that are conſiderably hot: But this taſte is ſo eaſie loſt upon the leaſt heat, and even in the free Air, that 'tis hard to know what it is that produces it. It is not only found in waters that are eſteem'd to be Aluminous and Vitriolate, but alſo in thoſe that are manifeſtly Nitrous, and which abound in Sulphureous Salt oppoſit to Acids.

The Cauſes of the Heat of ſome Mineral waters are little known. There is reaſon to doubt, whether there be Subterraneous fires capable to heat them; or whether they have received this heat by the exhalations of ſome Mineral juyces that are fermentable, or in which ſome efferveſcence is made by the mixture of other juyces.

All theſe difficulties have retarded the publication of theſe Obſervations, which, it ſeems, this *Royal Academy* hath been theſe four Years a making upon the waters, that have been ſent them from divers Provinces of *France*, and that have undergone their examen as occaſion hath ſerv'd for it.

Having premiſed theſe particulars, to manifeſt the Difficulty and nicety of this kind of reſearch; they ſubjoyn the Method employ'd in this examination; which indeed is made with that conſideration that becomes the wiſdom and care of that Illuſtrious Body, and is adapted to lead them into a greater knowledg of thoſe waters, than thoſe Authors had that have hitherto written of them, and that very often have not judg'd of them but by the effects, which might be referr'd to divers cauſes.

Now, according to this *Examen* made upon a great number of waters from different Springs, both hot and cold, they have particularly obſerv'd *Salts* and *Earths* of divers qualities, and in different quantities.

The *Salts*, which condenſed after diſtillation, or a ſlow evaporation of the waters, were brought before them, are here reduced to two ſorts; *viz.* The *one* is the *Nitre* of the Antients, wch they deſcribe to be a ſulphureous mineral Salt, like to the *Alcali* of Plants; the *other*, the *Common Salt* conſider'd in either of its different portions, or according to the commixture of both together: And 'tis remarkable, me thinks, that in none of thoſe waters there

there appear'd any Allum, or true Vitriol, except the water of *Vahls* in *Dauphine*, which yielded a salt that had some resemblance to *white Vitriol.*

They take notice, that they did not much apply themselves to observe the *Forms* and *Figures* of each of those Salts they met with in their condensations, because they found them vary in *the same* Salts, according to the manner and degree of the evaporation of the water wherein they were dissolved for refinement.

As to the *Earths* that were found in different quantities in the waters here examin'd; they acknowledg likewise, that the particular discernment of their *species's* was yet less easie than that of the *species* of Salts. Some of those Earths were white, some gray, some rediſh; and in the evaporation of all those waters, their terrestrial parts form'd themselves diversly; some into floting filmes, some into flocks, some into mucilages; others into little clods; others into small grains of sands; others into fine brown powder: Again, some dissolved almost wholly in distilled vinegar, with some effervescence; some dissolved but in part, some not at all; others only gave to the distilled vinegar a high tincture of hyacinth, wch was lost in few daies: Again, the fire made some of these Earths change colour, others not; and some of them it calcined, and vitrified others.

These observations of the qualities, quantities, differences and agreements of the Salts and Earths of so many waters, examin'd by these *Philosophers*, (of which a particular History and account is here given) may be very useful & serviceable to those Physitians that advise the use of them, the better to make choice of those, which by reason of the mixture of those more sensible mineral matters may sute with their intentions for the restoring of many Patients to their former health.

For a conclusion of this History, they give us some Advertisements and Corollaries, worthy indeed to be taken notice of; as,

1. That the great quantity of mineral waters, which Physicians make those to drink, to whom they prescribe them for the cure of certain contumacious diseases that will not yield to ordinary remedies, gives us occasion to judg, that the chief effect, which they make us expect from them, is the cleansing of the *viscera* by this internal ablution,: And that this effect is considerable, because most of Chronical diseases come from the obstruction of the *viscera*, which this great quantitie of mineral drink may remove. Mean

time 'tis to be fear'd, that few Physicians take pains to search into the *particular* qualities of these waters, which yet are very differing, and considerable enough to induce them to an endeavour to know them well, that so they may make a better use of them, according to the differences of Diseases, and the different constitution of the Diseased. Now these *Mineral* waters may have different particular qualities upon this account also, that some of them come from places less distant from the surface of the Earth, others from deeper ones. The *former*, traversing Earths less compact, do resolve the Salts they there meet with, and charge themselves with some of the subtile terrestrial particles found in them, by making them evaporate. The *later*, being rarified in the depths of the Earth, whence they are elevated, do easily receive the mixtures of Mineral exhalations and vapours, which are frequent in those inner recesses; but those mixtures often not being discerned in waters carried away from their Sources, neither by the scent, nor by the taste, cannot be known but by the effects, which to refer to their causes is not alwaies so ealie, nor so certain.

2. That the knowledg here given of the Salts and Earths of many Mineral waters will not fully satisfie the curiosity of those, that would likewise be inform'd of the other causes of the proprieties of those waters; forasmuch as that, besides the mixture of the concrete matters found therein, there may also be found in them matters not concreted, so subtile and volatil, that there remains nothing in the sediments, that may come to be known to differ from the Salts and Earths, and which is not found any more in what passes by distillation. That sharp and vinous taste, above mentioned, which is lost in the Air and by heat, must have for its subject a spirituous & very volatil matter; which were worth the being known. Again, the heat which some waters have in their Sources, and at their issuing out of the Earth, may be ascribed to some hot vapours, that have mixed themselves with them in their course within the subterraneous depths, where the cold of the Air hath no free access: And certain particular effects of those waters upon divers subjects give occasion to judg, that they are not pure and uncompounded. And into these things this *Royal Assembly* are resolved to make further inquiries, both for the satisfaction of the Curious, and the benefit of the Publick. 3. Mean time the Observations of the *Salts* and *Earths* of these waters may, in their opinion, serve both in Physick and in mechanical Arts, to make us capable to judg of the agreeableness of some of these waters for certain uses and emploiments. The two kinds of Salts, to which they have reduced those of the Mineral waters of *France*, may have differences, which may divide each of those kinds into many *species*, as they have observ'd in the Salts that are extracted out of the Ashes of divers Plants, which they have noted to be like, some to true Nitre, others to Common Salt, and to retain the participation of the specifique proprieties of their subjects. Again, some of the Earths found with the Salts in the sediments of Mineral waters evaporated or distilled, may also have particular uses, according to their differences. Some *German* Physicians have observ'd, that the white Earth of the Mineral waters of *Swalbach* is purgative: Some bottles of it were brought to the *Parisian Academy*, of a vinous

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and ſtrong taſte: The Salt of its ſediment was nitrous, and made Sublimate diſſolved in common water to precipitate in a Mother of pearl colour, as the *Alcalies* of Plants do. The Earth ſeparated from this ſediment was white like *Creta*; but there was not enough to try its purging virtue. The true Nitre of the Antients being ſulphureous, and reſembling the Plants of vegetables, hath, as they have, this faculty of moving the belly. And that white Earth, which is found with the Nitrous Salts of the Mineral waters, may participate of the ſame quality, even as the calx of Salt of Tartar, coagulated by the ſecond Salt of Sea-water, retains ſome proprieties of its Salt, though it be inſipid, and not diſſoluble in water, but only in acid liquours, as is diſtilled vinegar, which diſſolves it with an effervescence, which hath likewiſe been obſerv'd in many white Earths of *Nitrous* Mineral waters.

4. As to the *Taſtes* of theſe waters tranſported, they could only judg of them by what they found when they received them: Thoſe that are at the Spring-head may diſcern them better, eſpecially thoſe that are ſharp and vinous, and whoſe taſte decayes or is loſt when they are kept, or expoſed to the Air. They may alſo better come to know the degrees of their Coloration by the powder of Galls, by Oak-leaves, and the like; and judg more exactly of their conſiſtence and weight. Which particulars could not be ſo well obſerv'd at ſuch a diſtance, at which great changes may have befal'n the waters in ſeveral reſpects.

5. Concerning that Vaporous matter of the ſharp and vinous Mineral waters; *that* ſeems to be the firſt Being of the Mineral ſulphur, and of the concretions thence reſulting. There are found Earths impregnated with this acid matter, being vaporo-ſulphureous, of the concretion whereof ſomtimes are made ſulphureous and vitriolique Minerals. And often there is not any Mineral concret made that is known, in thoſe Earths, where no Mineral ſulphur, nor Vitriol, nor Metal is found. This vaporous and indigeſted Mineral matter may very well be the principle of Vitriol; but in its firſt ſtate it can't be a vitriolique production, if it be found in Earths where there is as yet no vitriol. It is more eaſy to obſerve it in its products, when it hath received ſome mineral concretion. The moiſt Air penetrating into the Mine-ſtones that are inſipid, but impregnated with a Mineral ſulphur, which makes it ſelf ſufficiently perceived when it is diſingag'd by fire, manifeſts to the ſenſe a ſulphureous-acidity, which was not perceiv'd in it. And of the concret ſulphur of thoſe Mine-ſtones or Marcaſites, penetrated by the moiſt Air, there is form'd a vitriolique concret, which is the product of this Mineral ſulphur, the principle of which was an acid and very vaporous matter. This ſubtile, vaporous, acid matter doth not alwaies produce vitriolique concrets; it hapning in many ſoils, that for want of neceſſary diſpoſitions it remains in its firſt ſtate. We have obſerved in many waters impregnated with this acid vapour, that for all this there was not any true vitriol in it, nor any thing that had any reſemblance to Allum, and that the Salt which remain'd in their ſediment was ſuch Nitre as is deſcribed by the Antients, and which differs as much from Vitriol and Allum, as do the Alcalies or ſulphureous fixed Salts of Plants.

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The Salts, Vitriols and Alums, and other concrets resoluble in water, may be so mingled in the Mineral waters, as not to be well perceived there but in their sediments; but the sulphurs and Bitums are alwaies obvious to be discerned in the waters wherein they are, because they reside in them, or swim on them, not being capable to be mixed with them as Salts are. Of these we have perceived none in the waters that were sent us. Those that were very hot in their sources, did not appear to us more sulphureous, or more bituminous than the other. And if you meet with Sulphur or Bitumen in their Basons against the walls of their inclosures, or in their mud, possibly there are not such matters inflamed within the Earth that have heated those waters; it being more probable, that such waters contract their heat by the mixture of some hot waters they meet with in the deep places where they pass; and experience proving, that no combustible matter takes fire, or any considerable time keeps it without Air; and that, to extinguish the fire of sulphurs and bitums inflamed, there needs no more than to exclude the Air from them. And if any matter (as Gun-powder in mines) takes fire strong enough not to be chok'd under ground, it bursts what covers it, thereby to be enlarged, and to take Air.

If there be no constant subterraneal Fires, the heat of some Mineral waters, which continue to be hot in their sources, cannot be ascribed to them. 'Tis more likely, that in many places of the Earth there are hot vapors, the heat of which is conserv'd in deep and close places, where the Air hath no access to cool them, and where those rarified matters have not room enough to be more rarified, and so to become less hot or more dissipated. And that such hot vapors are the cause of hot Springs and natural Baths, may be confirmed hence: 1. Because these hot Mineral waters do not burn the mouth of those that drink of them at the issue of their sources, as common water would do heated by fire to the same degree: Which seems to proceed from the thinness of the matter that causes this heat in the water. And the flame of spirit of wine doth not so strongly burn the hand, as a live coal would do. 2. Because the heat of Mineral waters works not upon certain tender substances, as doth that of common water, which is contracted by fire in the same intenseness: For, whereas the leaves of Sorrel (*e.g.*) are soften'd and quickly boyled in common water moderately heated by fire, they did not so in the Mineral waters of *Nery* in the Country of *Bourbon*, which are the hottest in all *France*; but they only changed colour and became yellowish. 3. Because the Mineral waters have no greater disposition to boyl upon the fire, than common cold waters, there being as much time requisite for the one as the other to make them boyl upon the fire, *&c.*

Mean time, 'tis not so obvious to know the *Qualities* of these vapors thus heating the Mineral waters. It seems not necessary, they should *all* be Bituminous or Sulphureous, though *some* be so. There are many other substances that grow hot without taking fire, and the vapors of which mix themselves in hot Mineral waters, but the qualities of which are not discern'd but by the effects which they produce.

As for the different Effects of the Mineral waters, both hot, tepid and cold, in reference to *Health*, the Parisian Academy left the observations thereof

thereof to Physicians: But as to their Uses in *Mechanical Arts*, they take notice of what some or other of them perform (*e.g.*) in the maceration of Hemp, in the whitening of Linnen, in the tincture of Wool and Silk, in the dressing of Leather, in the tempering of Iron, in the boyling of Legums, in the watering of Plants, in the drinking of Cattel, and the like.

Touching the observations of their different *Weights* and *Consistences*, they intimate, that they can be better made at the spring-head, where they have not been alter'd in their composition, nor consistence. However they describe the particular Instruments by them employed for observations of this nature.

III. COCHLEARIA Curiosa, or the Curiosities of Scurvy-grass, *written in Latin by Dr.* Andr. Molimbrochius *of* Leipsig, *and English'd by Dr.* Th. Sherley *Physician in ordinary to his Majesty.* London, *in* 8o. 1676.

THE Ingenious Interpreter of this Book being of opinion, that the Author hath handled the Subject thereof so fully, that there remains little more to be said upon it than what he hath taken notice of, and being desirous that those of his Countrymen who are unacquainted with the Latin tongue might reap the benefit of it as well as Scholars, thought good to employ those hours of vacancy, allow'd him from other business, to put it into *English*. Therein the Reader will find not only a Description of the several kinds of this Plant, with its several Names, Place and Time of growth, temperature, and general vertues, but also an enumeration of the particular uses, medicinal vertues, and manner of applying each part of this Plant; together with a good description of all sorts of Medicines preparable from it, either by the Galenick or Chymical way: Besides that it will instruct all sorts of persons, how to make Wines, Sauces, Syrups, and distill'd waters of this Plant, for the good of their sick and languishing neighbours.

IV. Two Treatises, the one, Medical, of the GOUT, by Herman Busschof *Senior, of* Utrecht, *residing at* Batavia *in the East-Indies; the other, partly Chirurgical, partly Medical, containing some Observations and Practices relating to some Extraordinary Cases of Women in Travel, and to some other uncommon Cases of Diseases in both Sexes; by* Hen. van Roonhuyse, *Physician in ordinary at* Amsterdam. *English'd out of Dutch.* London *in* 8o. 1676.

THE Author of the *first* of these two Treatises, after he hath given us his thoughts of the true *nature* of the Gout, making it, in its true origin, a little inward swelling within the *periostium* or membran that covers the bones, caused from a dry and cold ill-natur'd vapour, driven thither out of the arteries, and by being there inclosed, distending that most sensible membran, and so producing violent pains; after, I say, he hath deliver'd this as the nature of this Disease, and withal examin'd all other opinions hitherto received of the same; He is very particular, from Experience, both made upon himself and others, in describing the *Cure* of the Gout, and that by burning with a soft and woolly substance, call'd *Moxa*, made by a skilful preparation of a certain dried Herb, highly valued by the *Chinese* and *Japonese*; of which he sent over a quantity to his Brother at *Utrecht*, from whence Mr. *Pitt* in St. *Pauls Church-yard* hath procured a parcel for the

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uſe of thoſe that are deſirous to employ it, not only for this purpoſe of curing the *Gout*, but alſo for that of removing the *Epilepſie*, *Madneſs*, and *Catalepſis*.

The *other* Treatiſe contains ſeveral happy cures of ſtrange ruptures and other remarkable accidents of the *Womb*; the manner of performing the *Ceſarean Section*, of curing the falling down of the womb, of curing wombs cloſed, and ſeveral cloſures of the *Vagina uteri*; of a happy cure of a Child's fundament cloſed, and of the Rupture of a Bladder; of the firm Union of the *dura mater* to the skull; of the modern Uſe and Abuſe of *Trepanning*, which is here ſhew'd not to be ſo often neceſſary, nor uſeful, as is commonly pretended; of grievous wounds in the Head, well cured without the Trepan; of the manner of cutting *Hare-mouths*, and ſeveral ſucceſsful operations thereof; of the happy cure of a wounded *Nerve*; and of an uncommon cure perform'd upon a woman, out of whoſe thigh a great piece of the bone was ſeparated, without ſhortning her leg, or hindring the motion of her going.

V. New and Curious Obſervations of the Art of Curing the VENEREAL *DISEASE*, &c. *Written in French by M. de* Blegny, *Chirurgion to the French Queen*; *Engliſh't by* Walter Harrys, *M.D. lately Fellow of New Colledge in Oxford.* London, *1676. in* 8o.

THE Ingenious Author, and the Learn'd and diligent Interpreter of this piece have repreſented unto us therein the Nature, Origine, Cauſes, Differences, Signs and Prognoſticks of this Diſtemper; and given us divers conſiderable Obſervations on the Means to cure the ſame when it is but Particular, (that is, fixt to ſome parts) as alſo on the Natural and Critical Motions, when it turns to be Univerſal, and hath infected the whole body; and likewiſe on the Means ſerving to raiſe the Artificial *Criſis* of it; together with an explication of the true Method of artificially raiſing the *Criſes* of the Univerſal Pox.

That which ſeems moſt peculiar to this Book is, that the Author pretends to have eſtabliſhed the Cauſe of the Pox upon Principles wholly new; *viz.* the Mixture and Confuſion of the *ſemen* of many different perſons, which at length exert their activities in this heterogeneous fermentation, degenerating into ſuch a high malignancy as this Diſeaſe carries with it. But though the Author renders a New Cauſe of this Malady, yet hath he the teſtimony of the Medical Faculty of *Paris*, that they have not found any thing in his Method of Curing, that is not conformable to ancient received Maxims; they judging withal, that the New Obſervations, which it doth contain, will ſerve to increaſe an emulation, for the future, towards a more diligent ſearch of the truth of things leſs known.

Errata left un-corrected in *Numb.* 124.

Pag. 579. l. 7. r. *Ionique order*. p. 585. l. 8. r. *'Tis beſt from*. ibid. l. 13. r. *if the winter do not overtake us*. p. 587. l. 2. r. *the Bees delight*. ibid. l. 6. r. *of green fillets*. ibid. l. 12. for, *in Angelica*, put a *full point* inſtead of *in*.

London, Printed for *John Martyn*, Printer to the *Royal Society*, at the *Bell* in St. *Pauls Church-yard*. 1676.

PHILOSOPHICAL TRANSACTIONS.

June 20. 1676.

The CONTENTS.

An Account of Virginia, *its Scituation, Temperature, Productions, Inhabitants, and their manner of planting and ordering Tobacco, &c. communicated by Mr.* Thomas Glover. *Advertisement of a Degree of a Great Circle, in* Engliſh *meaſures. Obſervations made of the late Eclipſe of the Sun,* June 1. 1676. *An Account of ſome Books:* I. *ELEMENS des MATHEMATIQUES, ou Principes Generaux de toutes les Sciences qui ont les GRANDEURS pour objet ; par* J. P. *à* Paris. II. *L'ART de PARLER, à* Paris. III. *The manner of raiſing, ordering and improving Forreſt-Trees; alſo how to plant, make and keep Woods, Walks, Avenues, Lawns, Hedges, &c. With Rules how to divide Woods and Land, and how to meaſure Timber, and other ſolid Bodies, by Mr.* Cook. IV, *and* V. *The* French Gardiner; *to which is annex't the* Engliſh Vineyard *vindicated; and the way of making and ordering Wines in* France.

An Account of Virginia, *its Scituation, Temperature, Productions, Inhabitants, and their manner of planting and ordering Tobacco, &c. Communicated by Mr.* Thomas Glover, *an ingenious Chirurgion that hath lived ſome years in that Country.*

Virginia being a part of the Continent of *America*, is diſtant from the Lizard or Lands-end of *England* a thouſand Leagues, and is bounded on the Eaſt with the main Ocean, on the Weſt with the *Appal-lean* Mountains, on the North with *De la wares*-bay and River, and on the South with the River of *Roanock*; the Country lieth within a Bay called the Bay of *Chiſepeek*; the mouth or entrance whereinto is due weſt, being about ſix leagues in breadth, and runneth up into the Country North and by Eaſt about one hundred Leagues, continuing the forementioned bredth a great part of the way, but narroweth by degrees towards the upper end about one half: The water in the Channel is for the moſt part nine fathom, but in ſome places not above ſeven: The Southernmoſt Cape of this Bay lieth in 37 degrees and odd minutes North-latitude, and within

the ſame are divers little Iſlands, upon ſome of which there are Plantations.

Into this Bay do iſſue ſo many large, pleaſant and commodious Rivers, as I verily believe no ſpace of ground of equal dimenſions in the whole world can boaſt of the like: The moſt eminent of theſe are, *James* River, *York*, *Rapa-han-nock*, *Poto-mack*, *Potuxen*, and *Choptanck*; the four laſt retain their *Indian* names. At the head of the Bay do enter three large Rivers, one whereof is called *Suſ-ca-hannah*, from a Nation of *Indians* ſo called, bordering on the ſame; the names of the other two I do not well remember. Beſides theſe, there are twice as many as navigable as theſe, but by reaſon they run not above thirty or forty miles, I ſhall forbear inſerting any of their names. *Potomack*, the largeſt of all the reſt, is at the mouth ten miles broad, and continueth that bredth for twenty miles up; from which place it is ſix miles broad, and continueth that bredth for thirty miles higher, and is in length about two hundred miles. This River lieth about the middle of the Bay, and divideth the Government between my Lord of *Baltamore* and Sr. *Will. Bartlet*; the other Rivers, whoſe names are here inſerted, are moſt of them two Leagues broad at the mouth, and ſome of them a hundred and fifty, others a hundred and twenty miles in length.

The *Tides* are ſcarce diſcernible, when the winds hold at North-weſt; but at other times they flow as they do in *England*, only they appear not ſo large; the reaſon whereof may be, becauſe the Tide diffuſeth it ſelf into ſo many ſpacious Rivers; neither is it needful, in regard the Bay and Rivers are deep enough without the help of the Tide to receive the biggeſt Ship in the world; only it is helpful to bring in veſſels when the winds are ſmall or oppoſite.

In the Rivers are great plenty and variety of delicate Fiſh; one kind whereof is by the Engliſh called a *Sheepſhead*, from the reſemblance the eye of it bears with the eye of a Sheep: This fiſh is generally about fifteen or ſixteen inches long, and about half a foot broad; it is a wholeſom and pleaſant fiſh, and of eaſie digeſtion. A Planter does oftentimes take a dozen or fourteen in an hours time, with hook and line.

There is another ſort which the Engliſh call a *Drum*; many of which are two foot and a half or three foot long. This is likewiſe a very good fiſh, and there is great plenty of them. In the head of this fiſh there is a jelly, which being taken out and dried in the Sun, then beaten to powder and given in broth, procureth ſpeedy delivery to women in labour.

At

At the heads of the Rivers there are *Sturgeon*, and in the Creeks are great ſtore of ſmall fiſh, as *Perches*, *Crokers*, *Taylors*, *Eels*, and divers others whoſe names I know not. Here are ſuch plenty of *Oyſters* as they may load ſhips with them. At the mouth of *Elizabeth* River, when it is a low water, they appear in rocks a foot above water. There are alſo in ſome places great ſtore of *Muſcles* and *Cockles*; there is alſo a fiſh called a *Sting-ray*, which much reſembleth a *Skate*, only on one ſide of his tayl grows out a ſharp bone like a bodkin about four or five inches long, with which he ſtrikes and wounds other fiſh, and then preys upon them.

And now it comes into my mind, I ſhall here inſert an account of a very ſtrange Fiſh or rather a Monſter, which I happened to ſee in *Rapa-han-nock* River about a year before I came out of the Country; the manner of it was thus:

As I was coming down the forementioned River in a Sloop bound for the Bay, it happened to prove calm; at which time we were three leagues ſhort of the rivers mouth; the tide of ebb being then done, the ſloop-man dropped his grap-line, and he and his boy took a little boat belonging to the ſloop, in which they went aſhoar for water, leaving me aboard alone, in which time I took a ſmall book out of my pocket and ſate down at the ſtern of the veſſel to read; but I had not read long before I heard a great ruſhing and flaſhing of the water, which cauſed me ſuddenly to look up, and about half a ſtones caſt from me appeared a moſt prodigious Creature, much reſembling a man, only ſomewhat larger, ſtanding right up in the water with his head, neck, ſhoulders, breaſt, and waſte, to the cubits of his arms, above water; his skin was tawny, much like that of an *Indian*; the figure of his head was pyramidal, and ſlick, without hair; his eyes large and black, and ſo were his eye-brows; his mouth very wide, with a broad, black ſtreak on the upper lip, which turned upwards at each end like muſtachoes; his countenance was grim and terrible; his neck, ſhoulders, arms, breaſt and waſt, were like unto the neck, arms, ſhoulders, breaſt and waſt of a man; his hands, if he had any, were under water; he ſeemed to ſtand with his eyes fixed on me for ſome time, and afterward dived down, and a little after riſeth at ſomewhat a farther diſtance, and turned his head towards me again, and then immediately falleth a little under water, and ſwimmeth away ſo near the top of the water, that I could diſcern him throw out his arms, and gather them in as a man doth when he ſwimmeth. At laſt he ſhoots with his head downwards, by which means he caſt his tayl above the water, which exactly reſem-

bled the tayl of a fiſh with a broad fane at the end of it.

On the Bay and Rivers feed ſo many wild fowl, as in winter time they do in ſome places cover the water for two miles; the chief of which are wild *Swans* and *Geeſe*, *Cormorants*, *Brants*, *Shield-fowl*, *Duck* and *Mallard*, *Teal*, *Wigeons*, with many others.

There likewiſe keep in the Rivers *Bevers* and *Otters*; the Bevers have their teeth ſo ſtrong and ſharp, that they gnaw down trees, wherewith they make damms croſs the waters, under which they keep, which are uſually called *Bever-damms*, and in ſome places ſerve in the room of foot-Bridges.

The original ſprings, that make all theſe Rivers, ariſe at the foot of the *Appa-lean* Mountains; but the Cataracts or falls of the Rivers are ſixty or ſeventy miles diſtant from the Mountains.

Theſe Mountains have their beginning Northward at the Lake of *Canada*, and run along the back of the Country to the South-weſt as far as the lake *Uſherre*, which is ſome hundreds of Leagues.

There was one Colonel *Catlet*, that was a good Mathematician, who with ſome other Gentlemen took a Journey to make ſome further diſcoveries of the Country to the Weſtward, and arriving at the foot of the Mountains early in the morning, they left their horſes, and endeavoured to gain the tops of the Mountains, which they accompliſhed about four of the clock in the afternoon, and then looking further forward they diſcovered other Mountains, whereof they took the altitude and judged them inacceſſible; which diſcouraged them from any further attempts, their deſign being chiefly to diſcover whether there were any Rivers that ran into the South-ocean.

Above five years ſince there was a German Chirurgeon, who obtained a Commiſſion from Sr. *Will. Bartlet* to travel to the South-weſt of *Virginia*, and to make diſcovery of thoſe parts: He went along the foot of the Mountains as far as the Lake of *Uſherre*, and diſcovered them to be paſſable in two places, and he gives a relation, that, while he was in an Indian town adjacent to the Mountains, there came four Indians on an Embaſſie to the King of that town, from a King that lived on the other ſide of the Mountains, who by the commandment of the King on this ſide were all ſtrangled, with which barbarous uſage he was much abaſhed, fearing the like cruelty; but they proved more civil to him, permitting him to depart in ſafety.

At his return he brought an *Emerauld*, and ſome *Spaniſh* mony, which he ſaid he had of the Indians bordering on the Lake of *Uſherre*,

Usherre, which caused some to think that some *Spaniards* are seated near upon the back of the Mountains.

Having hitherto discoursed of the Bay, Rivers, and Mountains, I shall now make some entrance into the Land; and first of the shores, which all along the Bay and Rivers are for the most part sandy, but only in some points there is some shingle cast up: but the Earth affordeth very few Stones, and those that are there, are almost all of them hard & transparent. I have taken up several stones, that would cut glass as well as any Diamond. Sr. *Henry Chichely* had a stone, that was taken up by the Rivers side, which he put into a Ring, for which Ring he hath been proferr'd fifteen pounds; and I do verily think, that there are some stones gathered there that do abate the price of Diamonds; for I have seen several Rings of *Virginia* stones, which in my judgment have equalled Diamonds in lustre.

The Chiefs of all the Rivers are full of great veins of *Iron-mine*, and in some places of the Countrey I have seen Rocks of the same to lye a foot above the Earth; and generally all the high Lands under the mould are a meer Rock of Iron; the consideration whereof together with the infinite plenty of wood did cause me with admiration to enquire, why they did not endeavour the improvement of that advantage which God and Nature had put into their hands, by running of this Mineral; but I was answer'd, That an Iron-work would cost three thousand pounds, and the Countrey being generally poor, were discouraged from the attempt by reason of the charge. I believe the true reason is, their being so intent on their *Tobacco-Plantations* that they neglect all other more Noble and advantageous improvements, whereof the Countrey is capable, which without doubt are many. For in their planting Tobacco they find greatest encouragement from *England*, by reason of the vast revenue it brings into the *Exchequer*.

They distinguish their soil into three sorts, *viz.* High, low and marshy Land; all which have some sand mix'd in them, that makes their Land warmer than ours is in *England*. Their high Lands are most sandy, but do notwithstanding bear very good Crops of Tobacco; only it does not holds its strength so long as the low ground, which is very rich, being a blackish mould about a foot deep, or somewhat more, and will hold its strength for seven or eight Crops successively without manuring. Their Marshlands bear sedges and rushes after the manner of ours; and of these they have not endeavoured any improvement as yet. Their Land in general is as good and fertile as the Land of *England*; when the strength of their ground

ground is worn out they never manure it to bring it in heart, but let it lie for pasture for all Mens Cattel to grase upon, and clear more ground out of the Woods to plant in.

As to the *Timber* of this Countrey, there are divers kinds; four several sorts of *Oak*, very tall and smooth. There is also another sort of Timber called *Hickery*, that is harder than any Oak. There are also very large and tall *Poplars*; and in some parts of the Countrey great store of *Pines*, fit for Masts of Ships: There is likewise black *Walnut*, *Cipress*, *Cedar*, *Dogwood*, *Ash*, *Elm*, *Gum-tree*, *Locust*, *Chesnut*, *Hasel*, *Sassafras*, *Holly*, *Elder*, with several others.

As to the *Fruit-Trees* of the Countrey, it affords great plenty: For there are few Planters but that have fair and large Orchards, some whereof have twelve hundred Trees and upward, bearing all sorts of *English* Apples, as *Pear-mains*, *Pippins*, *Russetens*, *Costards*, *Marigolds*, *Kings-apples*, *Magitens*, *Batchelours*, and many others, of which they make great store of Cider.

Here are likewise great *Peach-Orchards*, which bear such an infinite quantity of Peaches, that at some Plantations they beat down to the Hoggs fourty bushels in a year.

Here are also great store of *Quinces*, which are larger and fairer than those of *England*, and not so harsh in taste; of the juice of these they also make Quince-drink.

Here are likewise *Apricocks*, and some sorts of *English Plums*, but these do not ripen so kindly as they do in *England*.

There are some sorts of *Pears*, but at very few Plantations; I have seen the *Bergamy*, *Warden*, and two or three other sorts, and these are as fair, large and pleasant as they are in *England*.

Here grow as good *Figgs*, as there do in *Spain*, but there are few planted as yet.

Those that take the pains to plant *Goose-berries*, have them; but I never saw any of our *English Currants*, (Riberries) there, and it is observ'd, that *Oranges* and *Limons* will not grow there, though they do in more Northern Countries.

I had almost forgot to mention their *Mulberry-Trees*, whereof they have good store about their Houses; these were planted at first to feed Silk-worms, but that design failing, they are now of little use amongst them.

The meanest Planter hath store of *Cherries*, and they are all over *Virginia* as plentiful as they are in *Kent*. The Cherry-Trees grow more large generally than they do in *England*, and bear more plentifully without any pains-taking of digging about them, or pruning them.

There

There groweth wild in some places of the Woods a Plum somewhat like our *Wheat-Plum*, but it doth exceed it, being much more succulent.

In the Woods there are abundance of *Vines*, which twine about the Oaks and Poplars, and run up to the top of them; these bear a kind of *Claret-grapes*, * of which some few of the Planters do make Wine, whereof I have tasted; it is somewhat smaller than *French* Claret; but I suppose, if some of these Wines were planted in convenient vine-yards, where the Sun might have a more kindly influence on them, and kept with diligence and seasonable pruning, they might afford as good grapes as the Claret-Grapes of France are.

* *These Vines have very large Bodies.*

There is also in the Woods a little Shrub which beareth a Berry like our *Elder-berry*, and is a very pleasant Berry to eat.

I lately made mention of the *Chesnut*, *Walnut* and *Hasel*-Tree, which all of them bear their several Nuts; and beside these, here is another called a *Chincopine*, which is like a Chesnut, with a Burry husk, but lesse by far.

Their Gardens have all sorts of *English* Pot-herbs, and sallets; they have *Cabbages*, *Colworts*, *Colly flowers*, *Parsnips*, *Turnips*, *Carrets*, *Potatoes*, and *Yams*; and such Herbs as grow wild in *England*, and do not grow there, they plant, as *Wormwood*, *Fetherfew*, *Houseleek*, *Carduus Benedictus*, *Rue*, *Coriander*, *Enula*, and the like.

They have likewise in their Gardens *Roses*, *Clove-Gilliflowers*, and variety of other sorts of Flowers.

There grow wild in the Woods, *Plantane* of all sorts, *Yellow-Dock*, *Bur-Dock*, *Solomons-seal*, *Egrimony*, *Centory*, *Scabious*, *Groundsel*, *Dwarf-Elder*, *Yarrow*, *Purslan*, and white *Maiden-hair* the best that ever I saw. Upon the sides of the Hills, *Asarum*; and on the Bay-side, *Soldanella* or *Sea-Scurvygrass* in great plenty.

Here groweth the *Radix Serpentaria Nigra*, which was so much used in the last great pestilence, that the price of it advanced from ten Shillings to three pounds *sterling* a pound: Here is also an herb which some call *Dittany*, others *Pepper-wort*; it is not *Dittany of Candia*, nor *English Dittander*; it groweth a foot or a foot and half high, the leaves are about the bredth of a groat, and figur'd like a heart, and short out of the stalk and branches one of a side directly opposite to each other; it smelleth hot like Pepper, and biteth upon the Tongue. The water of this herb distill'd out of a Limbeck, is one of the best things I know to drive worms out of the Body; and an ounce of this water taken, provoketh sweat plentifully.

Here

Here grow two Roots, which ſome Phyſicians judg, the one to be *Turbith*, the other *Mechoacan*; but whether they be the right or no, I could not well judg. Both theſe Roots are purging, and in their operations much like thoſe we have at the Apothecaries, only ſomewhat more forcible; the reaſon may be, becauſe there we have them more new and ſucculent.

Here groweth a Plant about a foot and half or two foot in height, the leaves are rugg'd like to a Borage leaf, but they are longer, and not above two fingers broad; about the ſtalk, where the leaves grow out, there hang Berries, which being ripe are yellow: The *Engliſh* call it the *Fever* and *Ague-root*. This Root being newly taken out of the ground, and a dram and half of it infuſed in beer or water the ſpace of twelve hours, purgeth downward with ſome violence, but I have given a dram of the Root in powder, and then it only moveth ſweat, and that but moderatly. It is a little bitter in taſte, and therefore ſomewhat hot.

There are great numbers of Herbs, whoſe names, nature, virtues and operations are altogether unknown to us in *Europe*; neither have there been any *Phyſicians* in thoſe parts that have made it their buſineſs to underſtand much of them; but if the uſe of them were well known, it might prove a great and beneficial addition to the *Materia Medica*.

Now I have done with the Plants, I will render ſome account of their ſtocks of *Cattel*, which are greater than ours, conſidering the quantity of People, and might be much larger than they are, were the Inhabitants as careful in looking after them and providing fodder for them as they in *England* are. All that they give their Cattel in winter is only the husks of their *Indian* Corn, unleſs it be ſome of them that have a little wheat-ſtraw; neither do they give them any more of theſe than will ſerve to keep them alive, by reaſon whereof they venture into the Marſhy grounds and ſwamps for food, where very many are loſt.

They have as great plenty of Horſes, and as good as we have in *England*.

As to their *Sheep*, they keep but few, being diſcouraged by the Wolves, which are all over the Countrey, and do much miſchief amongſt their Flocks.

In the Woods are great ſtore of *Deer*, and ſome *Rabbets*, which are generally miſtaken for Hares.

There are alſo ſeveral ſorts of ravenous Beaſts, as *Wolves*, *Racoons*, *Wild cats*, *Poſſums*, *Monacks*, *Flying Squirrels*, with two other ſorts;

ſorts; and in the Northern moſt parts of the Countrey ſome *Bears*.

The Fowls that keep the Woods are, wild *Turkies*, *Turkie Buzzards*, *Turtle-Doves*, *Partridges*, *Hawks* of ſeveral ſorts, which many others of leſs note.

There are alſo divers kinds of ſmall Birds, whereof the *Mocking-bird*, the *Red-bird*, and *Humming-bird*, are the moſt remarkable; the firſt, for variety and ſweetneſs of notes, the ſecond for his colour, and the laſt for the ſmalneſs of his body. As to the *Mocking-bird*, beſides his own natural notes, which are many and pleaſant, he imitateth all the birds in the woods, from whence he taketh his name; he ſingeth not only in the day, but alſo at all hours in the night, on the tops of the Chimneys; he is ſtrangely antick in his flying, ſometimes fluttering in the air with his head right down and tail up, other times with his tail down and head up; being kept tame, he is very docible. The *Red bird*, as I hinted before, taketh his name from his colour, being all over of a pure blood-red. The *Humming-bird* taketh his name from the noiſe he makes in flying: This is of divers colours, and not much bigger than a *Hornet*, and yet hath all the parts of a bird entire.

There are five or ſix ſorts of *Snakes*, amongſt which the *Rattle-Snake* is moſt remarkable, being about the bigneſs of a mans legg, and for the moſt part a yard and a half long; he hath a Rattle at the end of his Tail, wherewith he maketh a noiſe when any one approacheth nigh him, which ſeemeth to be a peculiar providence of God to warn people to avoid the danger; for this Creature is ſo venemous, that the bite of it is of moſt dangerous conſequence, unleſs they ſpeedily make uſe of the proper antidote; of which I ſhall take occaſion to ſpeak ſomewhat hereafter. There are alſo long *black Snakes*, ſhort and thick *black Snakes*; this latter ſort often times ſucks the Cows, and cauſes them to give bloody milk. There is another ſort called the *Corn-Snake*, becauſe he is uſually found in Corn-fields; this is near as big as the *Rattle-Snake*. There are alſo ſome other ſorts of *Land-Snakes*, all of which are more or leſs venemous; beſides there are very many *Water-Snakes*, that keep the Springs and Rivers.

Of the Indians *themſelves.*

The *Indians* are generally well proportioned as to their ſtature, being ſomewhat tall, but no waies corpulent; their hair black, uſually hanging right down; their eyes alſo black, their skin tawny, inclining to blackiſhneſs; they live together in Towns, and every town is under a ſeveral King: At the firſt coming of the

Engliſh divers Towns had two or three thouſand Bow-men in them; but now, in the Southern parts of *Virginia*, the biggeſt Indian Town hath not above five hundred Inhabitants; many Towns have ſcarce ſixty Bow-men in them, and in one Town there are not above twenty, and they are ſo univerſally thinned in the forementioned Southern part, that I verily believe there are not above three thouſand left under the whole government of Sir *Will. Bartlet*; but in my Lord of *Baltimores* territories at the head of the Bay, where the *Engliſh* were later ſeated, they are more numerous, there being ſtill in ſome Towns about three thouſand *Indians*. But theſe being in continual wars with each other, are like ſhortly to be reduced to as ſmall numbers as the former.

Inſtead of Cloaths they wear a *Deer*-skin tacked about their middle, and another about their ſhoulders, and for Shoes they have pieces of *Deer*-skin tied about their feet.

Their habitations are Cabins, about nine or ten foot high, which are made after this manner: They fix Poles into the ground, and bring the tops of them one within another, and ſo tie them together: the outſide of theſe poles they line with bark to defend them from the Injuries of the weather, but they leave a hole on the top, right in the middle of the Cabin for the ſmoak to go out; round the inſide of their Cabins they have banks of Earth caſt up, which ſerve inſtead of ſtools and beds; they have no kind of houſhold-ſtuff but Earthen-pots, Wooden bowls, and thin Mats to lie on; all which they make themſelves.

Their diet is *Indian* Corn, Veniſon, wild Turkies, Oyſters, and all kind of Fiſh the Rivers afford; and all kind of wild Beaſts of the Woods.

They are prohibited the keeping either Cows, Sheep or Hoggs, by the *Engliſh*, leſt they ſhould make bold with more than their own.

They did formerly catch their fiſh after an odd manner before the *Engliſh* came amongſt them, which was thus: At the head of their *Canoes* they fixed a Hearth, on which in a dark night they would make a blaze with fire put to the ſhivers of *Pine tree*; then they would paddle their *Canoes* along the ſhoar in ſhoal-water; the fiſh ſeeing the light would come as thick as they could ſwim by each other about the head of the *Canoes*; then with ſticks that were pointed very ſharp at the ends, they would ſtrike through them and lift them up into the *Canoe*: But now they have learned of the *Engliſh* to catch fiſh with hook and line, and ſometimes

times the *Engliſh* do uſe their way in dark nights, only they ſtrike with an Inſtrument of Iron ſomewhat like Mole-tines.

As to their Worſhip, I know little of it; only they have Prieſts which are generally thought to be Conjurers; for, when they have great want of Rain, one of their Prieſts will go into a private Cabin, and by his Invocations will cauſe abundance to fall immediately, which they call making of Rain.

They offer the Firſt fruits of all things; the firſt *Deer* they kill after they are in ſeaſon, they lay privately on the head of a Tree near the place where they killed it, and they ſay, no good luck will befal them that year if they do not offer the firſt of every thing.

They burn the Bodies of the dead; and ſow up the aſhes in Matts, which they place near the Cabbins of their Relations.

Some of them ſay, that the God of the *Engliſh* is a good God, and gives them good things; but *their* God is an angry God, and oftentimes beats them.

Almoſt every Town differs in language, and yet not any of their languages copious; as may be ſeen by their frequent expreſſing their meaning to each other by ſigns.

Their mony is of two ſorts, one whereof is made of a white kind of ſhell, which being divided into ſmall parts, they put them on a ſtring after the manner of Beads; this they call *Peacke*: The other is of a blew ſhell ordered in the ſame manner, which they call *Rounda*; this laſt is the meaner ſort, about half a yard whereof is of equal value with our nine pence. The chief of the *Indians* do wear ſome of this on the *Deer*-skins about their bodies, laid on like lace.

They have nothing to trade with but *Deer* skins, and ſome *Bever*, which they exchange with the *Engliſh* for Guns, Gunpowder, Shot and Brandy; having nothing before but Bows and Arrows, wherewith they killed their *Deer* and other wild Beaſts.

They have no other account of Time but by the changes of the Moon.

Their Winter is uſually in *November*, *December* and *January*.

They are very revengful; for, if any one chance to be ſlain, ſome of the Relations of the ſlain perſon will kill the murtherer or ſome of his family, though it be two or three generations after, having no juſtice done amongſt them in this reſpect but what particular perſons do themſelves; if that may be termed juſtice.

The *Indians* being a rude sort of people use no Curiosity in preparing their Physick; yet are they not ignorant of the nature and uses of their plants, but they use no correctives to take away the flatuous, nauseous, and other bad qualities of them. They either powder, juyce, infuse or boyl them, till the decoction be very strong.

Their usual way of cure for most inward distempers is by decoction, which they make partly pectoral, partly sudorifick; these they cause the sick to drink, the quantity of half a pint at a time, two or three times a day; but they give nothing to procure vomiting in any distempers, as a bad omen that the diseased will die; neither did I ever know them to use any waies of Blooding or Cupping.

If they have any Wounds, Ulcers or Fractures, they have the knowledge of curing them. I did once see an *Indian* whose arm had been broken, and viewing the place, I found the bones to be as smoothly consolidated, and as well reduced, as any *English* Chirurgion could have done it.

All *Indians* carry a Powder about them to cure the bites of *Snakes*, and in almost every Town this powder hath a different composition, and every composition is certainly effectual to the correcting the malignity of the Venom. Neither was it ever known to us, that any *Indian* suffered much harm by these bites, but in a daies time he would be as well as if he had never been bitten: Whereas some of the *English* for want of a speedy remedy have lost their lives.

The *Indians* are frequently troubled with Violent Colicks, which oftentimes terminate in Palsies.

The manner of planting and ordering Tobacco.

In the Twelve-daies they begin to sow their seed in beds of fine Mould, and when the Plants be grown to the bredth of a shilling, they are fit to replant into the Hills; for in their Plantations they make small hills about four foot distant from each other, somewhat after the manner of our Hop-yards; These hills being prepared against the plants be grown to the forementioned bigness (which is about the beginning of *May*,) they then in moist weather draw the plants out of their beds, and replant them in the hills, which afterwards they keep with diligent weedings. When the plant hath put out so many Leaves as the ground will nourish to a substance and largeness that will render them Merchantable, then they take off the top of the plant; if the ground be very rich, they let

a

a plant put out a dozen or sixteen leaves before they top it; if mean, then not above nine or ten, and so according to the strength of their soyl, the top being taken if the plant grows no higher; but afterwards it will put out suckers between their leaves, which they pluck away once a week, till the plant comes to perfection, which it doth in *August*. Then in dry weather, when there is a little breez of wind, they cut down what is ripe, letting it lie about four hours on the ground, till such time as the leaves, that stood strutting out, fall down to the stalk, then they carry it on their shoulders into their Tobacco-houses, where other Servants taking of it, drive into the stalk of each plant a peg, and as fast as they are pegg'd, they hang them up by the pegs on Tobacco-sticks, so nigh each other that they just touch, much after the manner they hang Herrings in *Yarmouth*; thus they let them hang five or six weeks, till such time as the stem in the middle of the leaf will snap in the bending of it; then, when the Air hath so moistned the leaf as that it may be handled without breaking, they strike it down, strip it off the stalk, bind it up in bundles, and pack it into Hogsheads for use.

Sometimes they are forced to plant their hills twice or thrice over, by reason of an Earth-worm which eats the root, and when the plant is well grown they suffer damage by a Worm that devours the leaf, called a *Horn-worm* (an *Eruca* or Caterpillar) which is bred upon the leaf; if these worms be not carefully taken off, they will spoil the whole Crop.

In the Year. 1667 in *August* there happened all over *Virginia* a gust or storm of Wind and Rain, which continued for three daies with such violence that the like was hardly ever heard of, it began and continued blowing at East with such fierceness, that above one half of the crop of their Tobacco which was then standing in their fields was blown away and torn apieces; the Trees in the Woods all over the Country were blown up by the roots in an innumerable quantity: The Waters in the Bay in some places were drove a great way into the Woods, and the greatest part of those that housed Tobacco, had their Tobacco-houses blown down and their Tobacco spoiled; so that there was not fully one part of three saved of what would have been made that year.

The Planters houses are built all along the sides of the Rivers for the conveniency of Shipping; they build after the *English* manner, whiting the inside of their houses with Mortar, made of burnt Oyster-shells instead of lime. They have pure and wholesom

water,

water, which they fetch wholly from Springs, whereof the Country is so full, that there is not a house but hath one nigh the door.

Advertisement concerning the Quantity of a Degree *of a Great Circle, in* English *measures.*

SOme while since an account was given * concerning the *Quantity of a Degree of a great Circle*, according to the tenour of a printed *French* Discourse, entituled *De la Mesure de la Terre.* The Publisher not then knowing what had been done of that nature here in *England*, but having been since directed to the perusal of a Book, composed and published by that known Mathematician *Richard Norwood* in the year 1636, entituled *The Seaman's Practice*, wherein, among other particulars, the compass of the *Terraqueous Globe*, and the *Quantity of a Degree* in *English* measures are deliver'd, approaching very near to that, which hath been lately observ'd in *France*; he thought, it would much conduce to mutual confirmation, in a summary Narrative to take publick notice here of the method used by the said *English* Mathematician, and of the result of the same; which, in short, is as follows:

* *See* N. 112, *and* N. 124 *of these Tract.*

A. 1635 the said Mr. *Norwood*, Reader of the Mathematicks in *London*, observ'd, as exactly as he could, the Summer-Solstitial Meridian Altitude of the Sun in the middle of the City of *York*, by an Arch of a Sextant of more than five foot *radius*, and found it to be 59 *deg.* 33'. And formerly (*vid. A.* 1633.) he had observ'd the like Altitude in the City of *London* near the *Tower* to be 62 *deg.* 1'. Whereupon he actually measured, for the most part, the way from *York* to *London* with Chains, and where he measur'd not, he paced it, (wherein, *he saith*, through custom he usually came very near the truth;) observing all the way he came, with a *Circumferentor*, all the principal Angles of position or windings of the way, with a competent allowance for other lesser Windings, Ascents and Descents; not laying these down by a *Protractor* after the usual manner, but framing a *Table* much exacter and fitter for this purpose; as may be seen in the *English* book it self. And by this Method and Measure he found the Parallel of *York* from that of *London* to be 9149 chains, every chain being six poles or ninety nine feet, $16\frac{1}{2}$ *English* feet to a Pole. Now, these 9149 Chains being equal to 2 *deg.* 28'. (the aforesaid Latitude between those two Cities) a little calculation makes it appear, that *one Degree* of a Great Circle, measured on the Earth, is 367196 of our feet, *numero rotundo* 367200, or 22254 Poles; which make 556 Furlongs and 14 Poles,

14 Poles, or $69\frac{1}{2}$ *Engliſh* miles and 14 Poles; 8 Furlongs to a mile, and 40 Poles to a Furlong. Which being compared to that meaſure of a Degree, which is deliver'd in the above-mention'd *French* Diſcourſe, will be found to come very near it, they finding 73 miles *ferè*, at 5000 feet to an *Engliſh* mile, which make 365000 feet; whereas the $69\frac{1}{2}$ *Engliſh* miles and 14 Poles, found by Mr. *Norwood*, amount to 367200 feet, reckoning 5280 feet to an *Engliſh* mile, as the true meaſure of it is; whence the difference between theſe two meaſures appears to be no more than 2200 feet, which is not half an *Engliſh* mile by 440 feet.

If any one deſire to know further the whole *Circumference*, as alſo the *Diameter* and *Semidiameter* of the ſaid Terraqueous Globe, according to this meaſure, he will eaſily find,

The Circumference to be	25056 *ferè.*
The Diameter,	7966
The Semidiameter,	3983

Obſervations made of the late Solar Eclipſe on the firſt of June, 1676. ſt. v.

One, by *Francis Smethwick* Eſquire, as followeth:

Initium defectionis Weſtmonaſterii *h.* 7. 50′. } *poſt med. noctem*
Finis, *h* 9. $54\frac{3}{4}$. } Junii 1. 1676.

Totius Eclipſis duratio, horæ 2. $4'\frac{3}{4}$.

Tempus obſervatum fuit cum horologio oſcillitario, vibrante minuta ſecunda, & correcto per obſervationes. Tubus adhibitus fuit bonæ notæ, pedum $7\frac{1}{2}$.

The other, by Mr. *Colſon* at *Wapping*, near *London*, as followeth;

Temp. juxta horol. oſcill.	*Phaſes.*	*Solis alt.*	*Tempus correct. ex altit.*	
h. ′ ″		° ′	h. ′ ″	
7.34.50		22.46	7.36. 0	
7.37.14		33.10	7.38.40	
7.39.10	dig.	33.30	7.40.48	
7.50.40	$\frac{1}{4}$	——	7.51.51	*Tubo optico æſtim.*
dub. 8. 8.34	$1\frac{1}{4}$	——	8. 9.45	*Tubo optico menſur.*
8.17.25	$2\frac{1}{10}$	——	8.18.36	
8.27.10	$3\frac{1}{10}$	——	8.28.21	
9.39.—	$1\frac{1}{2}$	——	9.40.—	*Tubo æſtim.*
9.43.—	$1\frac{1}{4}$	——	9.44.—	
9.48.—	$\frac{1}{4}$	——	9.49.—	
9.54.25	*non finita*	——	9.55.36	
9.55.55	*finita.*	——	9.57. 6	
4.26. 5	*Solis alt.*	32.10	4.26.56	
4.28.58		31.53	4.29.52	
4.31. 21		31.31	4.32.16	

An Account of some Books.

I. *ELEMENS des MATHEMATIQUES, ou Principes Generaux de toutes les Sciences qui ont les Grandeurs pour Object; par* J.P. *A* Paris, 1675. in quarto.

THe Author of this Work makes it his business to deliver a short and easie Method to compare *Quantities*, and to discover their Proportions and Relations to one another by Characters of Numbers, and Letters of the Alphabet; affirming to have here demonstrated things in a Geometrical order, and rendred the *Algebraical* Analysis much easier, and treated the same more fundamentally than hath been done hitherto.

By *Quantity* he understands here not only the Extension in length, bredth and depth, but whatsoever we conceive to be capable of more or less, and that can be exactly measured, whether it be exactly known, or supposed such. Thus Time, Weight, Celerity, and even the Sensible Qualities, the Degrees of Perfection, being capable of more or less, are, to him, the Object of the Mathematicks. For, *saith he*, if you do exactly know these perfections and qualities, you may compare them in order to know exactly their proportions, and if you do not know them exactly, you may compare them by supposition: For, if you know, that a piece of Iron (*e g.*) is four times heavier than such a piece of Wood; by supposing that Wood is a thousand times weightier than Air, you may conclude by this supposition, that the Iron is 4000 times heavier than Air.

He considers, that though *Arithmetick* be a Science from which all others depend; yet 'tis this *Algebra*, which serves to elucidate, extend and perfect, as much as is possible, Arithmetick, and generally all the Sciences that relate to the Mathematicks: It being so general, that it considers all Quantities, and what it demonstrates being capable to be applied not only to Numbers Lines and Figures, Weights and Velocities; but also to all *such* Numbers, Lines, Velocities, and particular quantities, as you can conceive in each species of Quantities.

But 'tis not only the Extent and Universality of *Algebra*, for which he commends it; but also the Facility it affords to the mind of discovering the most hidden Verities, and which 'tis impossible to manifest by ordinary Arithmetick and Geometry, or by the aid of any other Science; since it not being possible to give to our understanding a greater extent and capacity than it hath, this Science only teaches to manage it, *by* representing to it under very short expressions an Aggregat of many Ideas, by taking it up so little by the senses

ſenſes that it leaves it in a manner altogether to it ſelf, and *by* aſſiſting it to run through all the proportions of Quantities which it examines, in a dextrous, expedit and eaſie manner: So that nothing eſcapes the underſtanding in the ſubject under conſideration; and the clear and diſtinct neatneſs of its ratiocinations alwaies diſcovers to it the ſhorteſt way of reſearched Truths, as many of them as it can come to know, or the means which it wants to attain them, if it cannot know them.

He takes notice, that, there being particular Sciences that depend from *Geometry*, there are thoſe that conſider the ſame as the general Principle of all knowledge: And that, foraſmuch as Geometry is pleaſing enough by reaſon of the Figures that fall under the Imagination, there are many that do inconſiderately prefer it to *Algebra*; and that they imagine withal, that the Geometrical Demonſtrations by Lines are the only true ones, becauſe they make themſelves as 'twere ſenſible. To this he ſaith, that he is not ignorant, there are things peculiar to Geometry that muſt be known and demonſtrated by Figures; but that, to handle this Science as it ought, we are often obliged to make uſe of *Algebra*, and that, becauſe the proofs thereof are the moſt general and the moſt ſimple, they are therefore to be accounted the moſt Natural Demonſtrations.

And if it be objected, that Incommenſurable Quantities cannot be diſcovered nor expreſſed by Numbers, but they alwaies may by Lines, and ſo Geometry is more exact and of a greater extent than the Science of Numbers: He anſwers, 1. That Incommenſurable Quantities may alwaies be expreſſed by Incommenſurable Numbers; and if the Incommenſurable Numbers are not altogether known, 'tis becauſe the Incommenſurable Quantities, implying ſomewhat of infinite and incomprehenſible, are not capable of being fully known. 2. That Lines are never the true expreſſions of Incommenſurable Quantities, nor even of the Commenſurable, foraſmuch as that which maketh the quantity not known, cannot be an expreſſion thereof; and that the lines, of which the Geometricians pretend to expreſs the unknown quantities, do not make known their quantities. He grants it to be true, that Geometricians do demonſtrate, that thoſe Lines are equal to thoſe Quantities; but he adds, that thoſe lines themſelves are unknown to the Underſtanding, though they are known by the Eyes or by the Imagination; and that, if you would have expreſſions ſpeaking to the Mind and not to the Eyes, you muſt recur to Incommenſurable

numbers: So that *these* numbers are still more known than those lines, seeing they do better express and represent them to the Understanding. As (*e.g.*) this number $\sqrt{20}$ is much more known, than the Hypothenusa of a right angle of which the sides are 2 and 4; for, 'tis at least known, that $\sqrt{20}$ is about $4\frac{1}{2}$; and if you will know it more precisely, you may, by the rules of the Approximation of Roots. But you *know* not the bigness of the Line that sustains a right angle, though you *see* or *phancy* it.

He observes further, that the Analytical (which is the principal) part of *Algebra*, is incomparably more fertil for the discovery of Truths, than Figures, and that without it 'tis in a manner impossible to resolve an infinity of Problems. For, *saith he*, how can any man *imagine* that long concatenation of embarassing Lines and Figures, where you ought to see distinctly so many different proportions and respects, before you know what it is that the resolution sought for do h immediately depend upon.

Now, as to the Order which our Author hath observed in those Elements, they are divided into two Parts. The *first*, containing *five* books, explains and demonstrates *both* the Supputation with *Numbres*, which is otherwise call'd *Arithmetick*, and that of *Symbols* or Letters, which is called *Algebra*. The *other*, in *four* books more, explicates and treats fundamentally of the *Analytical* part, teaching to resolve Questions, and to discover the General Truths of the Mathematicks; that is to say, those which regard Quantities generally taken, yet without supposing other knowledge than what is granted; but making use of those Operations only that are establish't in the first part.

In the *first* book of all, the Author shews, that an Unit and Numbers are the sole Idea's, by which we can regulate the measure of Quantities, and exactly determine what is knowable of them. And after he hath explained the fundamental Idea's that serve us to compare quantities amongst themselves; he teaches in the sequel of this book the four first Operations that are made by *Numbers* or Entire quantities, which are considered as Proportions, whereof the first term only is expressed, and the second, which is alwaies an Unit, understood.

The *second* book is of the same Operations upon *Fractions*, which are Proportions of quantities, of which every term is expressed.

The *third* is of Powers and their Resolutions, whereof all the Rules are included in one only Problem, by means of a *Table* that represents in an Epitome all those Rules with their Demonstration,

tion, after a manner that is not less general than simple and easie to understand.

And since this Resolution of the Powers doth not alwaies afford Commensurable quantities, or such as are exactly known, but sometimes Incommensurable ones; these are explicated in the *fourth* book, together with all the Operations that are made concerning them.

The *fifth* treats of the Comparison of Proportions: Which part he finds to be so vast and fruitful, and the uses thereof to be of such an extent in most Sciences, that there are few, if any, that can be well taught without it. The Geometrical Equalities and Proportions, which are one sort of the *genus* of Equalities, are the things that render this part so considerable, and for the elucidating of which our Author hath most of all employed himself in this work; and the *four* last books of the *second* part are nothing but a sequel of what hath been said of the Equalities in the *fifth* book of the *first* part.

Now in the said *four* books he settles first the Grounds of Analysis. *Next*, after having there given some *idea* of the method of *Diaphantus*, and of that of *Vieta*, he is particular in explaining the method of *Des-Cartes*, which he esteems to be the most general, the most fertil, and the most easie of all. Yet seeing that this famous Man hath not demonstrated, nor so much as explained, all the Principles which he hath made use of, our Author intimates, that the Reader will not find in his Writings the same advantages for understanding his *Analysis*, as may be had from these Elements. For, after he hath clearly explained and demonstrated all those Principles, he thence deduces in order not only all the Discoveries made by *Des-Cartes*, but also other new and more useful ones. For it may be seen in the *last* book, that those new Discoveries furnish Rules that are much shorter than the *Cartesian*, and one may even draw analytically from them much of certain and very universal knowledge, which he did not believe could be discovered without the aid of Parabolical lines, or such other as belong to the *Geometria composita*, as the Hyperbolick, &c.

But, forasmuch as the Author esteems that these Elements are principally written for Beginners, and even such as have not so much as the knowledge of Arithmetick, he desires that such Readers would have their pen at hand, to make themselves the operations of all the different Examples, deliver'd in great number, his

aim being to accuſtom them to practiſe the Rules, and to make thoſe things familiar and ſenſible to them, which at firſt ſeem to be abſtract and difficult enough, eſpecially to thoſe that are not yet accuſtomed to the exerciſe of their Underſtanding. As for thoſe that are already verſed in common Arithmetick and Algebra, they, *he ſaith*, have diſcerning enough to exempt themſelves from reading what they already know. Though he hopes withal, that there will be thoſe that will not find it tedious to peruſe all, that ſo they may obſerve the connexions, which poſſibly they had not yet obſerved, between all thoſe Truths and the different parts of the Mathematicks; and to eſtabliſh alſo their knowledge upon principles, that may perhaps appear to them more plain and more natural, and in leſs number than thoſe which they have uſed hitherto.

II. *De l'ART de PARLER*; *à* Paris, 1675. in duodecimo.

AS there was printed at *Paris*, ſome years ſince, the *Art of Thinking*, (whereof an Account was given in *Numb.* 106. of theſe Tracts,) ſo there is lately publiſhed in the ſame place this *Art of Speaking*, of which ſome Deſcription is intended here.

This Author doth not, as is ordinary, crowd his book with a heap of Precepts, whereby the Memory is burthen'd and the Mind embaraſſed; but, like a good philoſopher, makes it his chief buſineſs to teach the Ground of the Art he treats of, and its Natural Principles, which being well known, there needs not that multitude of Rules, which ſlip out of the Memory almoſt as ſoon as they are entred.

Now to make the Reader comprehend the true Reaſons of the *Principles* of Rhetorick, he begins with explaining, How Diſcourſe comes to be formed; and there being nothing better than Nature her ſelf to teach us the form that our Words ought to have for expreſſing our Thoughts and the Motions of our Will, he repreſents to himſelf a Troup of Men newly born and that never have ſpoken before. He conſiders what theſe Men would do: He ſhews, that being ſoon tired with expreſſing their mind to one another by *Geſtures*, they would quickly find the advantage of *Speaking*, and form a Language to themſelves: He inquires, what form they would give to that language; and in this inquiry he laies the Foundations of all languages, and renders the Reaſon of all the Rules preſcribed by Grammarians; ſhewing that this reſearch is very

very useful to learn Languages with more ease, and to speak them with more exactness. And having made these New Men act their part, he declares, what hath been the true Origin of Tongues, and that 'tis not Hazard that hath made men find out the Use of Speech; yet shewing withal, that Speech is subject to mens Will, and that Custome or the common Consent of men exercises an absolute power over *Words:* Whereupon he gives Rules to know which are the Laws of *Custome*, and to observe them, after he hath instructed his Reader which are the Laws prescribed by *Reason.* And these are the Contents of the *first* of the *Four* parts of this Book.

In the *second* part he observes, that the most fertil Languages are not able to furnish terms proper to express *all* our Idea's, and that therefore we must have recourse to Art, borrowing terms from things that are in a manner alike, or have some connexion or relation with those that we would express, and for which the ordinary use doth not afford us proper words: Which borrowed Expressions are called *Tropes*; of all the kinds and uses of which he treats at large. In the same part he takes notice, that *as* Nature hath so dispos'd our Body as that it falls into postures proper to shun what may hurt it, or into those that are fittest to receive what may do it good; so the same leads us to take certain turns in speaking, capable to produce in the minds of our hearers the effects we desire, whether it be Meekness or Choler, Hatred or Love: Which terms are called *Figures*; of which the Author treats with a particular diligence, not being content to give us their Names with some Examples, (as is vulgarly done) but also teaching us the Nature of each *Figure*, and the Use to be made thereof.

Next he considers in the *third* part, that forasmuch as the facility with which men speak, and the pleasure that a discourse well pronounced begets, have brought men rather to make use of Speech to signifie their thoughts, than of any other Sign; they have therefore studied to find in the ranging of Words, that which makes a discourse to be utter'd more easily, and to be heard more delightfully. And hereupon the Author enlarges himself by shewing, what is to be avoided, and what is to be observed in the disposition of the words to facilitate the Utterance and to please the Ear. And here it is that he treats of the composition of Periods and of the Art of Versification; and having shewed what it is that can please the Ear in the sound of words, he adds, how the Rules prescribed by Masters for composing Periods and making Verses in all languages,

ges, have made for their end the rendering the delivery easie and pleasant.

In the *fourth* part he treats of *Styles* or Manners of speaking, diversified according to the several inclinations and natural dispositions of Men. Here he proposes his advice for regulating a *Style*; and, because every matter must be handled in a way suitable to it, he teaches how to raise or depress, sweeten or asperate a style according as the nature of the Subject requireth. On which occasion he examines the quality of the Style of Orators, Poets, Philosophers, Historians.

He concludes the Book with giving us a very fair *Idea* of the *Art of Perswading*, which is very different from the *Art of Speaking*, in regard that not all those that speak well know the secret of gaining hearts.

In the whole, and particularly in the discovery made of the nature of the Art of *Rhetorick*, there are to be found considerable reflexions upon our *Mind* (of which *Speech* is an Image,) which may contribute not a little to bring us to the knowledge of our selves. And every Curious Spirit will doubtless be pleased to learn to know the reasons here given of all the Rules, which the *Art of Speaking* prescribes; This Author, when he treats of what it is that pleaseth in a discourse, not contenting himself with saying 'tis *something I know not what*, but naming the very thing, and leading the Reader to the very source of that pleasure, and making him understand the very principles of those Rules, which those do follow that give delight in Speaking, &c.

III. *The manner of raising, ordering and improving Forrest Trees: Also how to plant, make and keep Woods, Walks, Avenues, Lawns, Hedges, &c. with several Figures proper for Avenues and Walks to end in; and convenient Figures for Lawns: Also Rules and Tables, shewing How the ingenious Planter may measure superficial Figures; With Rules, How to divide Woods and Land; and how to measure Timber and other Solid bodies, either by* Arithmetick *or* Geometry, *&c. By* M. Cooke; *in quarto.*

1. IN former Times, not only Princely and Noble Palaces, and Seats of Honour, but also generally the Mansions of the Gentry, all over *England*, were adorned with Groves on the next Hills;

Hills; and, in nearer approaches, with goodly rows of ſturdy Oaks, tall Elms, huge Cheſnuts, and other ſtately Trees of *Engliſh* production: To defend the Avenues, Gardens, Orchards, Walks and Ridings from violent Winds and Storms in the rougheſt ſeaſons; and for cooling refreſhments in the Heats of Summer: And this was a credit and ſhelter in all fair *Villa's*, which are ſaid to be more in *England*, than on ſo much ground of any other part of *Europe*. And it was believed, that theſe long-liv'd Vegetables had ſome affinity, congruity, congeniality or propenſion to ſuſtain, cheriſh and lengthen the lives of Mortals; and to have ſomewhat of the nature of *Perennial Fountains*; to retain (round about them) a degree of Warmth in Winter *Froſts*, and of coolneſs (beſide their ſhades) in Summer Heats. Of Gardens and Orchards Mr. *J.W* ſaith, *p.*147,148. *The exerciſe of Planting, Graffing, Pruning and Walking in them, very much tendeth to ſalubrity, and to cure ſeveral diſtempers incident to our Natures (as hath been experienced,) and towards the prolongation of life.* And if any of theſe Vegetables participate of the nature of *ſmoaking Fountains*, it may reaſonably be apprehended, that they may attemper and mitigate the extremities of both Seaſons, to be more agreeable to Humane Conſtitutions.

2. And 'tis a real Truth (though I muſt here be more ſober than to mention it in good earneſt,) that (ſometimes) the ſtatelieſt Trees will familiarly treat, and anſwer diſtinctly to all the Diſcourſes, Noiſe and Voices of the Family, from the ſofter whiſper to the loudeſt raillery, with vocal imitation. And they are ſo perfectly Muſical, that they will keep Time and true Conſort to any Tune, from the higheſt Treble to the deepeſt Baſſe: And 'tis a great pleaſure to the Muſical (which are alwaies the beſt) Natures, to enjoy a Muſical Habitation.

3. And ſeriouſly this Vegetable Furniture was held a *ſure Mark*, to diſtinguiſh, at great diſtance, *Good Husbands* and *Hoſpitable Houſholders*, from *Waſteful* and *broken Conſumers of their Patrimony*.

4. And much is done lately, both for Ornament and Healthfulneſs, about the Amenities of the Royal Palaces, and of many other chief Manſions, by planting the moſt beautiful, wholeſom and verdant Trees, in all their Avenues, Walks and Ridings.

5. And much more may yet be done for the Credit and Reputation, as well as for the healthfulneſs and pleaſantneſs of *England*, if we proceed to follow the beſt examples, for places of Ancient

Honour;

Honour, for Cities and Towns; and especially for both our Famous Universities, where they have many Colledges with spacious Walks and fair Gardens.

6. And for our choice of the most convenient Plants, ingenious *Muffet* (in his third Chapter of *Healths-Improvement*) learnedly instructs us, by the experience of many Ages and Nations, to avoid some Plants of a noxious and poysonous breath, and to adopt Health-breathing Plants; of which benign kind great variety is now found by many Trials to agree with our Soyl and Climate. So that our *Universities* have no necessity to yield to the Reputation of *Leyden* for their *Aquatic Arbors*, since ours may soon be furnished with more wholesom, beautiful and fragrant Blossoms and Evergreens. And more Essays grow on apace.

For all these Concernments, I could do no less than give publick notice of the seasonable Aids and Encouragements herein afforded by this our skilful and industrious Author.

Postscript.

If among their Adorning-Trees due care be had for the planting of Mulberry-trees, *in the approaches of Cities and Towns, they may do well in time for many Poor in* England; *as the care for the same hath brought a vast Treasure into* France.

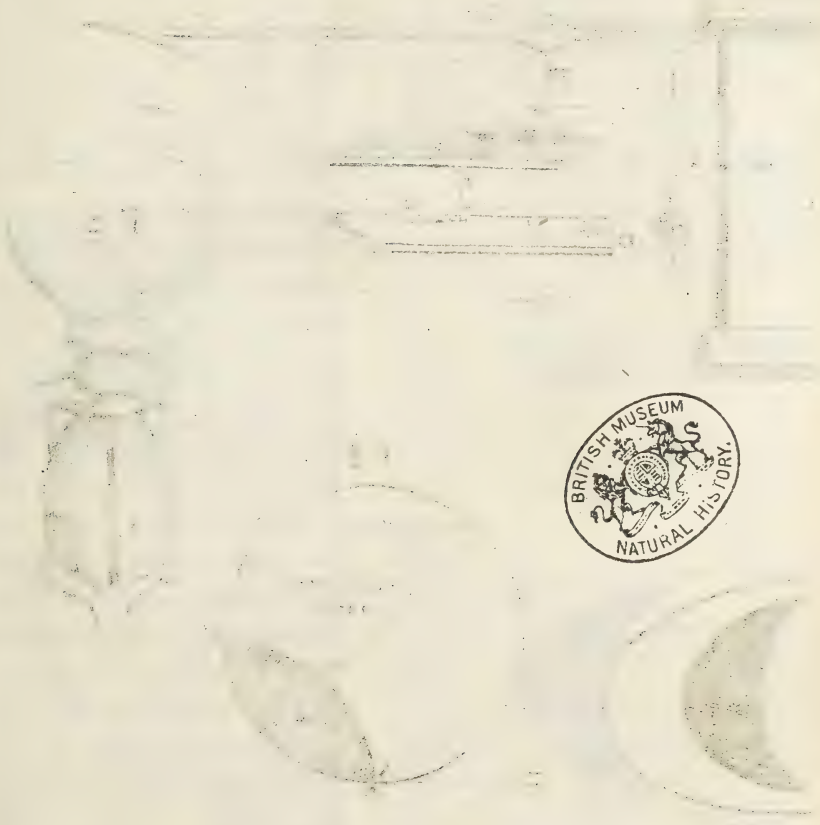
IV *and* V. *The* French Gardiner *reprinted; to which is annexed the* English Vineyard *vindicated, and the Way of making and ordering Wines in* France, *&c.*

FOr another Concernment I must again give notice, that *The French Gardiner*, which gives proper Instructions for the culture and propagation of the best Esculent Plants, (which are yet much wanting in *England*,) is reprinted in a *third* Edition, Illustrated with Sculptures: To which is annexed, *The English Vineyard vindicated*; and, *The Way of making and ordering Wines in France*: in octavo. Sold by Mr. *Tooke* at the Ship in *Paul's Church-yard.*

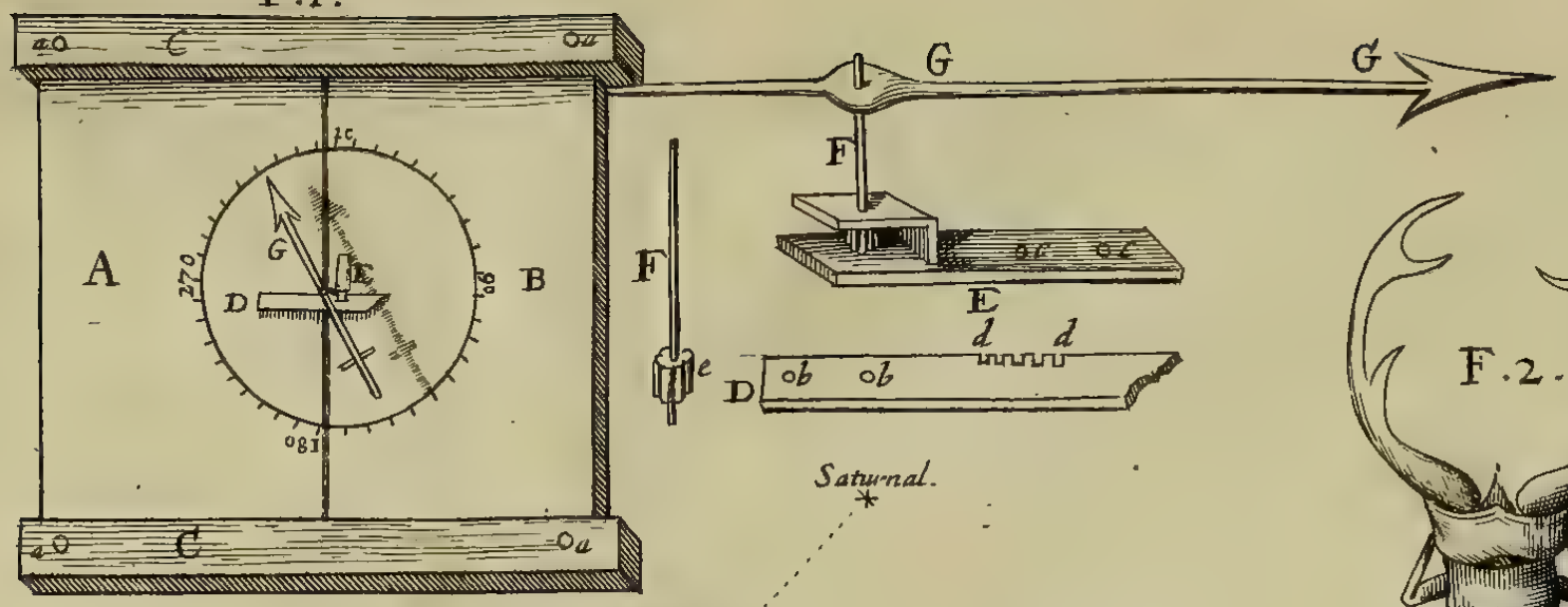
"The Fruits of the Earth, and especially of Trees (*saith Mr.* "J.W. *p.* 148.) were the first food ordained for Man to eat; by eating "of which (before Flesh became his meat) he lived to a greater "age than any since have been observed to have lived.

Errata in Numb. 125.
P. 602. l. 32. for *your* read *the*, ib. l. 36. r. *singeing.*

London, Printed for *John Martyn*, Printer to the *Royal Society*, at the *Bell* in St. *Pauls Church-yard.* 1676.


BRITISH MUSEUM
NATURAL HISTORY.

F. 1.



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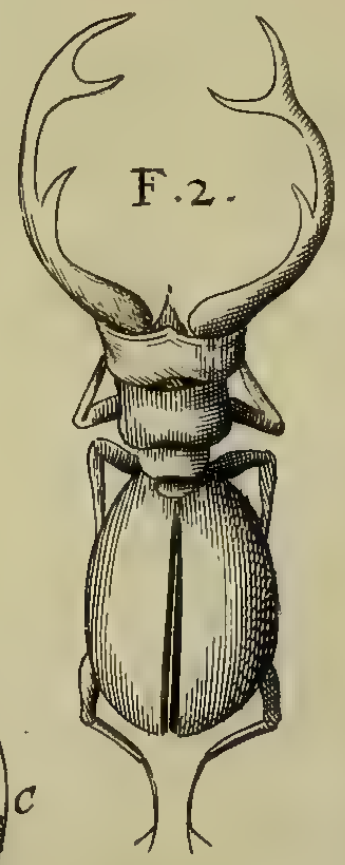


F. 3.

F. 4.

F. 5.

F. 6.

PHILOSOPHICAL TRANSACTIONS.

July 18. 1676.

The CONTENTS.

An Extract of a Letter written from Dublin *to the Publisher, containing divers Particulars of a Philosophical nature. viz. a Narrative of a strange effect of Thunder upon a Magnetick Sea-card; some Remarks concerning the gradual Alteration of the Temperature of the Air in divers Countreys; a contrivance of an uncommon* Hygroscope; *The Musky scent of certain parts of the Animal called* Musk-quash, *&c. Mr.* Leewenhoecks *Letter to the Publisher, about the Texture of Trees, and some remarkable discovery in Wine. Monsr.* Hevelius *observation of a* Solar Eclipse *of A.* 1675. *Mr.* Flamsteads, *Mr.* Townlyes, *Mr.* Haltons, *Signor* Cassini's *and Monsieur* Hevelius's, *Observations of the Late Eclipse of the Sun. An extract of a letter of Dr.* Matthias Mangold *of* Basel, *concerning a* Mathematico-Historical Table, *designed in that University; together with a Description of the same. An Account of four Books*: I. *Experiments, Notes &c. about the MECHANICAL Origin of divers particular QUALITIES; among which is inserted a Discourse of the imperfection of the CHYMISTS Doctrine of Qualities; together with some Reflexions upon the Hypotheses of ALCALI and ACIDUM: By the Honorable* Rob. Boyle *Esq;* II. TH. Bartholinus *de PEREGRINATIONE Medica &c.* III. Georg Hier. Velschij *Centuriæ duæ Observationum Physico-Medicarum.* IV. Joh. Nicolaus Pechlinius *M. D. de AERIS et ALIMENTI DEFECTU, et VITA SUB AQUIS.*

An extract of a Letter &c. from Dublin *May the* 10*th.* 1676.

SIR,

FInding amongst my *Adversaria* some observations, that I thought might not be unacceptable to you, nor impertinent to your design of making collections for the History of Nature; I have here sent you a few, of such as my other occasions would at present afford me leisure to recollect. This ensuing Narrative, concerning the strange effect of Thunder upon a Magnetick Sea-card, I had from one Mr. *Haward* that was Master of several ships, and a man of good credit.

He tells me, that being once maſter of a ſhip in a voyage to *Barbados*, in company of another, commanded by one *Grofton* of *New-England*, they were, in the Latitude (as I remember) of *Bermuda*, ſuddenly alarmed with a terrible clap of Thunder, which broke this *Groftons* fore-maſt, tore his ſayles, and did ſome damage to his rigging: But by that time the noyſe, together with the danger of this frightful accident, was paſt, Mr. *Haward*, to whome this Thunder had been more favorable, was however no leſs ſurpriſed, to ſee his companions ſhip ſteer directly homeward again: At firſt he thought, that perhaps the confuſion that the late miſchance had put them in, might have made them miſtake their courſe, and that they would ſoon perceive their error; but ſeeing them perſiſt in it, and being by this time almoſt out of call, he tack't and ſtood after them; and as ſoon as he got near enough to be well underſtood, asked where they were going: but by their anſwer (which imported, that they had no other deſign, than the proſecution of their former intended voyage) and by the ſequel of their diſcourſe, it at laſt appeared, that Mr. *Grofton* did indeed ſteer by the right point of his compaſs, but that the card was turned round, the North and South points having changed poſitions; and though, with his finger he brought the flower-de-Lys to point directly North, it would immediatly, as ſoon as at liberty, return to this new unuſual poſture; and upon examination he found every compaſs in the ſhip of the ſame humor: which ſtrange and ſudden accident he could impute to nothing elſe but the operation of the Lightning or Thunder newly mentioned. He adds, that he lent *Grofton* one of his compaſſes to finiſh the voyage; and withall that thoſe Thunder-ſtrucken ones did never to his knowledg recover their right poſitions again; and that he beleives, if Mr. *Grofton* be living, he hath one of them to this day.

That in *America* (at leaſt as far as the Engliſh plantations are extended) there is an extraordinary alteration, as to temperature, ſince the *Europeans* began to Plant there firſt, is the ioynt aſſertion of them all; neither hath it near ſo many admirers, as witneſſes: in regard that this change of temperature, is, and not without ſome reaſon, generally attributed to the cutting down of vaſt woods, together with the clearing and cultivating of the Country; but that *Ireland* ſhould alſo conſiderably alter without any ſuch manifeſt cauſe, doth certainly, either invalidate the reaſon generally admitted for the alteration of *America* newly mentioned, or els evince, that quite different cauſes may produce the ſame effect

For

newly brought from ſhore, nor could I eaſily perceive, it had any relicks of its late corruption.

That the Teſticles of the Animal called *Musk-quaſh* do ſmell ſtrong of Musk, as Mr. *Joſſelin* * ſaith, is moſt certain: For, I have known ſome of them kept a long time in ones pocket, till they were become hard and black, and yet ſmelt as ſtrongly as at firſt, which, in my opinion, was nothing inferiour to the ſcent of that, which is commonly ſold for *Musk* in the ſhops. I remember, that one of our Seamen, being laid to ſleep too near the fire-place, with one of theſe dried Teſticles in his pocket; it happen'd that a coal burn'd through breeches and all to it, and made ſo great a ſcent of musk, that he might eaſily have been ſmelt a good way off, and the fire might perhaps have advanced where there was a worſe perfume, had not the ſtrength of this awaken'd the man, and ſo made him withdraw his breech in time. This Animal deſerves to be further inquired into, eſpecially if what Mr. *Theuenot* relates be true, *viz.* That Musk is nothing elſe but the Teſticles of a beaſt like a Deer, found in the province of *Honan*, as 'tis noted in *Numb.* 14. *p.* 250. of your *Tranſactions*.

* See the account given of it in *Numb.* 85. *p.* 5024. of theſe Tracts.

Extract of a Letter, written to the Publiſher by Mr. Leewenhoeck *from* Delft, *April* 21. 1676; *Concerning the Texture of* Trees, *and ſome remarkable diſcovery in* Wine; *together with ſome Notes thereon* *.

* The Numeral figures in the margin and body of this Letter refer to the like figures in the *Notes* made thereon.

SIR,

MOnſieur *Conſtantin Hugens of Zulichem* was pleaſed to ſhew me the *Comparative Anatomy of the Trunks of Plants*, written by Doctor *Grew*, and told me, that he had very ingeniouſly and learnedly diſcourſed upon that ſubject; though I, by reaſon of my unskilfulneſs in the Engliſh Tongue, could have little more than the contentment of viewing the elegant Cuts.

I have formerly written unto you, *viz.* in my Letter of *Auguſt* 15 1673. that I had diſcovered in ſeveral Trees (1.) two ſorts of veſſels or pores, and did conceive, that the matter which ſerves for the increaſe of Trees was in (2) the *greater veſſels* ſent upwards, and that ſome ſmall particles did again deſcend in the *ſmaller Veſſels* to the roots, whereby was maintained a (3) Circulation alſo in Trees. 1. 2. 3.

But not finding by the figures of Dr. *Grew*, that he hath diſcover'd thoſe (4) two ſorts of Veſſels in the wooddy part, I here take 5.

the

the liberty of ſending you the Eight part of the tranſverſe Slice of an Aſh-ſprig of a years growth; and ſhall withall acquaint you, that beſides thoſe two ſorts of Veſſels in wood, I have diſcover'd a (5) third ſort; theſe two going directly upward, and this
5. third iſſuing out of the middle or the pith, going horizontally
6. to the circumference: So that the (6) whole body of Wood hitherto viewed by me, conſiſts of nothing but of ſmall hollow pipes.

Theſe pipes, out of which the firm wood is made up, are in
7. many places as (7) clear as cryſtal, and in other places, methinks, I
8. ſee them to conſiſt in part, of (8) ſmall globuls. The great Veſſels, obſerv'd and expreſſed by Dr. *Grew*, were ſeen by me very manifeſtly to conſiſt of ſmall globuls. Theſe great Veſſels are generally furniſh'd with ſmall membranes, which being cut thro gh, may be ſeen to lye obliquely in the Veſſels; and theſe I conceive to be
9. (9) valves.
10. (10) Theſe three ſorts of Veſſels then, I have obſerv'd not only in *Aſh*-wood, but alſo in *Elme*, *Oak*, *Willow*, *Shumack*, *Lime-tree*, *Apple*, *Pear*, *Plum*, *Walnut*, *Haſel*-tree &c. And all the Veſſels, which Dr. *Grew* hath repreſented in *Aſh* and other wood, though they differ from one another in bigneſs, yet, under favour, I take them
11. to be (11) of one ſort. And though I have ſome Obſervations which I keep yet to myſelf, yet this which concerns the three ſorts of pores or Veſſels I am willing to comunicate unto you, as I alſo have ſhew'd them here to divers curious perſons that were pleaſed to viſit me; to whom I have alſo made it out, as well as I could, how
12. Trees and other Plants do grow in height and thickneſs, (12) of which I doubt not but Dr. *Grew* hath written ſo learnedly that I ſhall not need to diſcourſe of it here.

Tab. II. *Fig.* 1. A B is one of the great pores or Veſſels of an *Aſh* twig of one years growth, cut longways the little twigg, through the
13. middle of the pores; which Veſſel conſiſts of (13) tranſparent globuls, where-in you may plainly ſee the ſmall oblique membrans
14. by me (14) cal'd valves, which membrans do not ly with their upper part extended one and the ſame way, but they lye ſo as that two ſides of them with their upper end reach towards one another, as CC. and DD. And if we ſuppoſe, that the hollowneſs of theſe greater Veſſels is as large as a hair of ones head, we may then very well ſay,
15. that the hollowneſs (15) of the ſmall ones is at leaſt 25 times ſmaller
16. than ſuch a hair. That theſe Veſſels (16) conſiſt of globuls, I have not only ſeen in *Aſh*-wood, but alſo in *Walnut*, *Haſel*, *Apple*, *Pear*, and *Plum*, trees &c.

Fig.

For if it be true, as ſome compute, that this Kingdom was better inhabited and husbanded before the late bloody war, than at preſent, it ſhould, according to the reaſons alledged for the change of temperature in America, be rather grown more intemperate, *viz:* for want of cultivation: But the contrary is obſervable here, and every one almoſt begins to take notice, that this country becomes every year more and more temperate. Now whether there were more inhabitants in *Ireland* before the late war than at preſent, I ſhall not here inſiſt upon, neither do I think it an eaſy matter to determine, yet ſure I am, that there hath been no ſuch increaſe of people here within theſe 16 or 20 years, nor ſuch improvements as to be accountable for the great change of temperature that is of late obſerved. Within leſs than the time newly mentioned, twas not unuſual to have froſt and deep ſnowes of a fortnight or three weeks continuance; and that twice or thrice, ſometimes oftner in a winter; nay we have had great rivers and lakes frozen all over, whereas of late, eſpecially theſe two or three years laſt paſt, we have had ſcarce any froſt or ſnow at all. Neither can I impute this extraordinary alteration to any fortuitous concourſe of ordinary circumſtances requiſit to the production of fair weather; becauſe it is manifeſt, that it hath proceeded gradually, every year becoming more temperate than the year preceding. If any in this city or country hath kept an exact account of the weather for at leaſt a dozen or fourteen years paſt, I doubt not but their Iournalls will verify, what I have only in general obſerved, and thus far inſiſted upon. For my own part, I was never furniſhed with leiſure nor conveniences before this year, to make any obſervations in particular of this kind; my occaſions being ſuch as required a removal from place to place, and for ſome time to the *Weſt-Indies*. As for the laſt year, I can only tell you in generall, that all the winter was very mild, and warmer than could be well expected from ſuch a ſeaſon, and but very little rain, having in the whole month of *February* not rained above twice or thrice (at leaſt in that part of the country where I was then,) inſomuch that many took upon them to predict, that ſuch unſeaſonable weather would certainly be the cauſe of ſome dearth or peſtilence (for all extraordinary appearances of weather, Meteors, &c. according to the Vulgar, muſt needs be preſagers of Miſchief) the enſuing Summer or Autumn; but their Predictions proved as falſe as the following Harveſt was extraordinary both for health and plenty.

This laſt winter now newly ended, I have Kept an exact account of wind and weather (as I intend to doe, God willing,

for the future) being well provided with a *Barometer*, *sealed Thermometers*, *Hygroscopes*, and all things requisit to the performance of so nice and necessary a Task. To transcribe my Journall here would be too tedious, and needless, untill I have made farther observations. Let it suffice therefore to tell you; *that* it hath been a very fair and warm, or rather no winter at all; *that* we have not had above five or six frosty mornings this winter, and none that lasted longer than till noon; that we had Snow but thrice; the first before Christmas, the second upon the 11*th.* and third upon the 17*th.* of *January*: This last, which was the longest Snow we had this winter, continued not 48 hours, but thawed. All this winter, we never had two daies of rain together, nor above two or three that could well be called rainy daies. *March* 14*th.* we had a shower of rain and hail together; the wind being S. W. and calm. The Mercury in my Barometer (which is very slender, but carefully filled, and conveniently placed) is for the most part about 29$\frac{4}{10}$ inches high above the surface of the stagnant Quicksilver; but yet doth very sensibly and frequently vary its height according to the difference of the Atmospheres gravity: *January* 17*th.* (which was the day it last snowed here) the ☿ was subsided to 28$\frac{9}{10}$ inches. The next day it was at 28$\frac{6}{10}$ being towards night somewhat blustering, and the snow thawed. *Jan.* 19*th.* being fair but very foggy, the ☿ was at 28$\frac{1}{2}$, which is the lowest station it was ever at yet with me; the wind was westerly and calm. The next day it was up again to 29 and afterwards higher. *Feb.* 15*th.* in the morning being cloudy, the wind Westerly and blustering, the ☿ was at 29$\frac{8}{10}$; and about 11 that night, being fair, clear and calm, it was risen to 30$\frac{2}{10}$ inches. The next day being still fair and calm, it was at 30$\frac{3}{10}$ inches; which is the utmost height I have yet seen it at. Next day it fell a little beneath 30, and kept, as before, for the most part about 29$\frac{3}{10}$ or $\frac{4}{10}$, to this present; only on the 11*th.* of *March* it was at 30 again. Though it be observed, that frosty and snowy winters make early springs, and for as little as we have had of either this winter, yet there hath not within the Memory of any now living happened a forwarder Spring in *Ireland*; since this place could produce some store of ripe Cherries in the midst of *April*. The wind keeps for the most part here between the North-west and the South, seldom at East, and yet seldomer at North or North-east, insomuch that many here don't scruple to affirm, that for at least $\frac{3}{4}$ of the year the wind is Westerly; and we have sometimes known passengers wait at *Chester* & *Holy head* noles than three months for a fair wind, to come hither.

The *Hygroscope* I make use of, I thus contrived. I took two

pieces of Deal board (Poplar would have been better) each about two foot long, and a foot or more in breadth, (A.B). These I got well plained, and shotten, that their edges might meet even together. Of these two, set edge by edge, I fastened each end between two ledges of Oak (C.C.) of two inches broad and long enough to reach athwart both boards, (but one ledge, if it be thick enough, might be made to serve each end, by making hollow furrows or gutters in it to receive the ends of the boards) and so I fixed both boards in, as pannels are set in Wainscot. This done, supposing $\frac{1}{4}$ of an inch to be the utmost distance that these two boards would shrink asunder in driest weather (for it mattered not much, though it should be somewhat more or less) I took a thin piece of Brass (D.) of two or three inches long and $\frac{1}{4}$ inch broad, and upon one edge towards the end I measur'd $\frac{1}{4}$ of an inch: (which was the utmost distance I supposed the two boards would gape assunder;) which space (*d.d.*) I divided into five equal parts, and with a small file made them into so many fine teeth, like those of a watch-wheel. This piece of Brass I plac'd flat, across the Juncture of the two boards, nayling its one end, by means of two small holes (b.b.) to the board A. only, and leaving the other end, which is the toothed one, free, and reaching to a competent distance over the board (B.) to which it had no coherence. Next I made a pinion, (consisting of as many teeth as the Brass had) (e) upon the end of a piece of thick Iron wire: This Axel (F) with its pinion (e) I so fastned to the other board (B) by means of the Brachiolum (E,) and so adapted to the teeth of the Brass plate, that when the boards do shrink assunder, the Brass being drawn a little away, must needs turn this Axel (by means of its toothed pinion) more or less; and so if ever it happens, that the boards gape but a quarter of an inch assunder, this Axel will have made one intire revolution: Wherefore I put a long index (G.G.) upon the extremity of this Axel, and made a circle round it with the usual graduations, numbered from what point I pleased, and the motion of the index back or forward, shews me the degrees of the drought or moisture of the Ayr. Now this Axel may be made to come through a round plate of wood or Mettle that hides the contrivance all but the hand and figures, as in a clock or Watch. Tis to be noted more over, that the boards must be fastned to the ledges, only at the outer edges, as at a.a.a.a. that they may have the more liberty of swelling and shrinking assunder. The commodiousness of this kind of *Hygroscope* in comparison of those made of wild Oat-beards may best be observed

Tab. 1. Fig. 1.

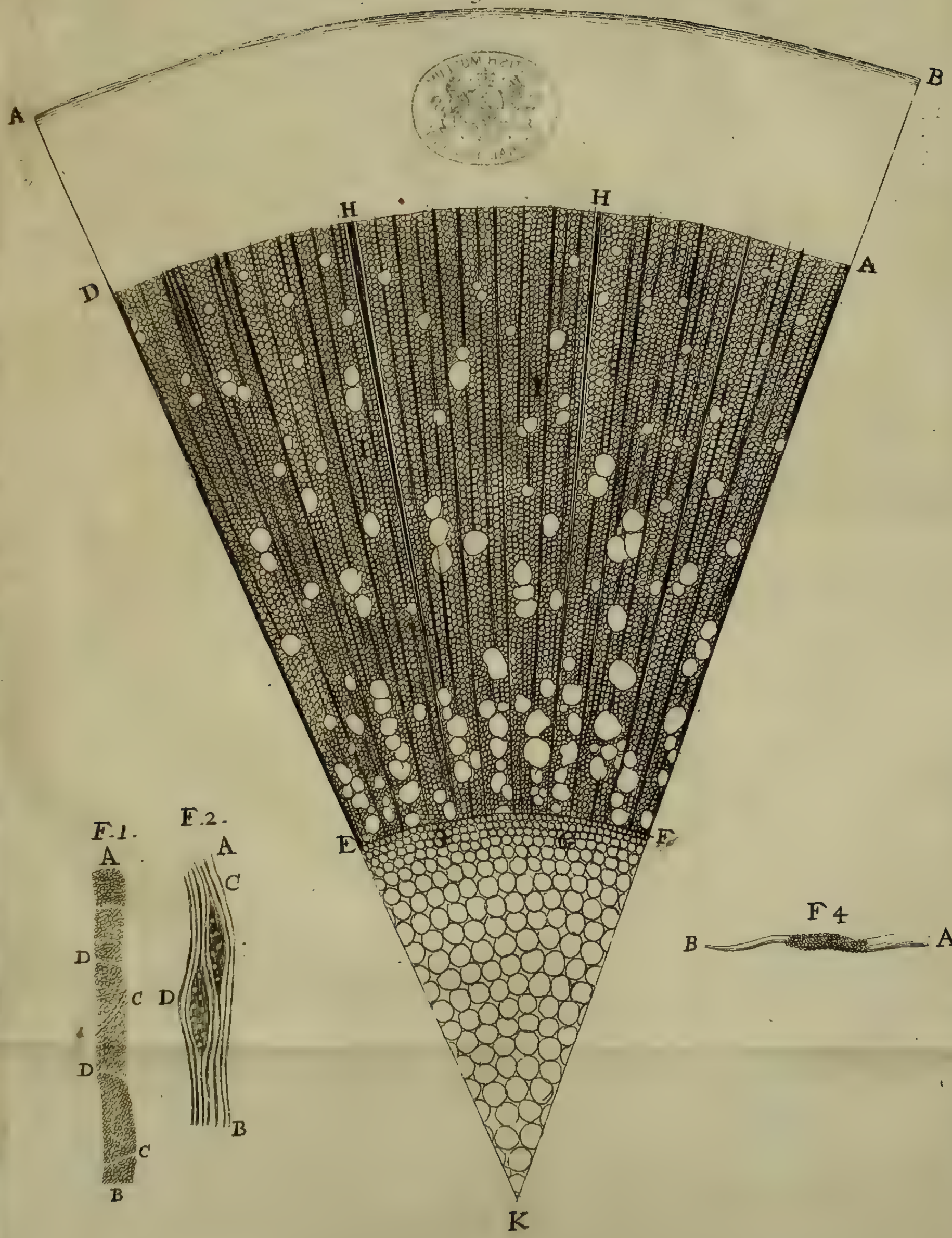
ved by those that are furnished with both; and therefore I shall only add, that if any one else hath made use, or thought of the like contrivance, it is more than I know: And withall, that though the one I make use of at present, be none of the best workmanship, nor exactly made after the description I have here given you (the boards having not liberty of gaping above $\frac{2}{10}$ of an inch) yet I have oftentimes the pleasure of seeing the *Index* turn no less than 10, sometimes 20 degrees, in an hour or two; and when the Ayr is changed, will return as swiftly, by the shrinking and swelling of the boards.

I have here withal sent you the Figure of an admirable instance of Natures luxuriancy in her contrivance even of Insects. Tab. 1 Fig. 2. Tis a Kind of large flying Beetle, of a dark shining brown, with a huge pair of horns, (in proportion to the body.) shaped and branched exactly like a Staggs, or Hatts, from which last it hath its denomination; Our people in *Virginia* and *New England* calling it a *Flying Hart*. It flies high and swift, and rests most commonly upon branches or trunks of standing Trees; where, as soon as it has taken up its station, it begins with a shrill chirping voice, which it raises by little and little till it make the whole woods ring again, and then lessens gradually till it ceaseth with a kind of silent murmur, as if the little creature had rung it self asleep: Then flies to some other place, and begins the same tune again. Though I have seen and heard many of them, yet I never had the fortune to light upon any of them dead or alive but one, which notwithstanding I left in *Virginia*, but by good luck had first drawn the picture of it, according to the copy you have here *; which represents its shape and size exactly, as it lay upon a book before me. Where it is to be noted that the Horns are of a shining hard Substance, and that the tips of them touch the same plane with the belly. I could willingly have taken some pains to observe the anatomy of these pretty Insects, and their manner of breeding and propagation, but the season of the year together with my employment were both unfavorable to my desire, and I was therefore forced to desist without further satisfaction.

* See Fig. 2

Though the Author in *Numb.* 27. of your *Transactions* seems inclinable to believe, that it is peculiar to the *Thames-water* alone, upon Stinking to be recoverable or potable again; I can affirm upon my own knowledge, that Water taken aboard at *New London* in *New-England*, though in eight days time it stunk intolerably, yet when we came to *Virginia*, it recovered so perfectly, that I made no scruple to drink of it in harbour even when we had fresh water newly

F. 3.



F. 1.

F. 2.

F 4

BRITISH MUSEUM
NATURAL HISTORY.

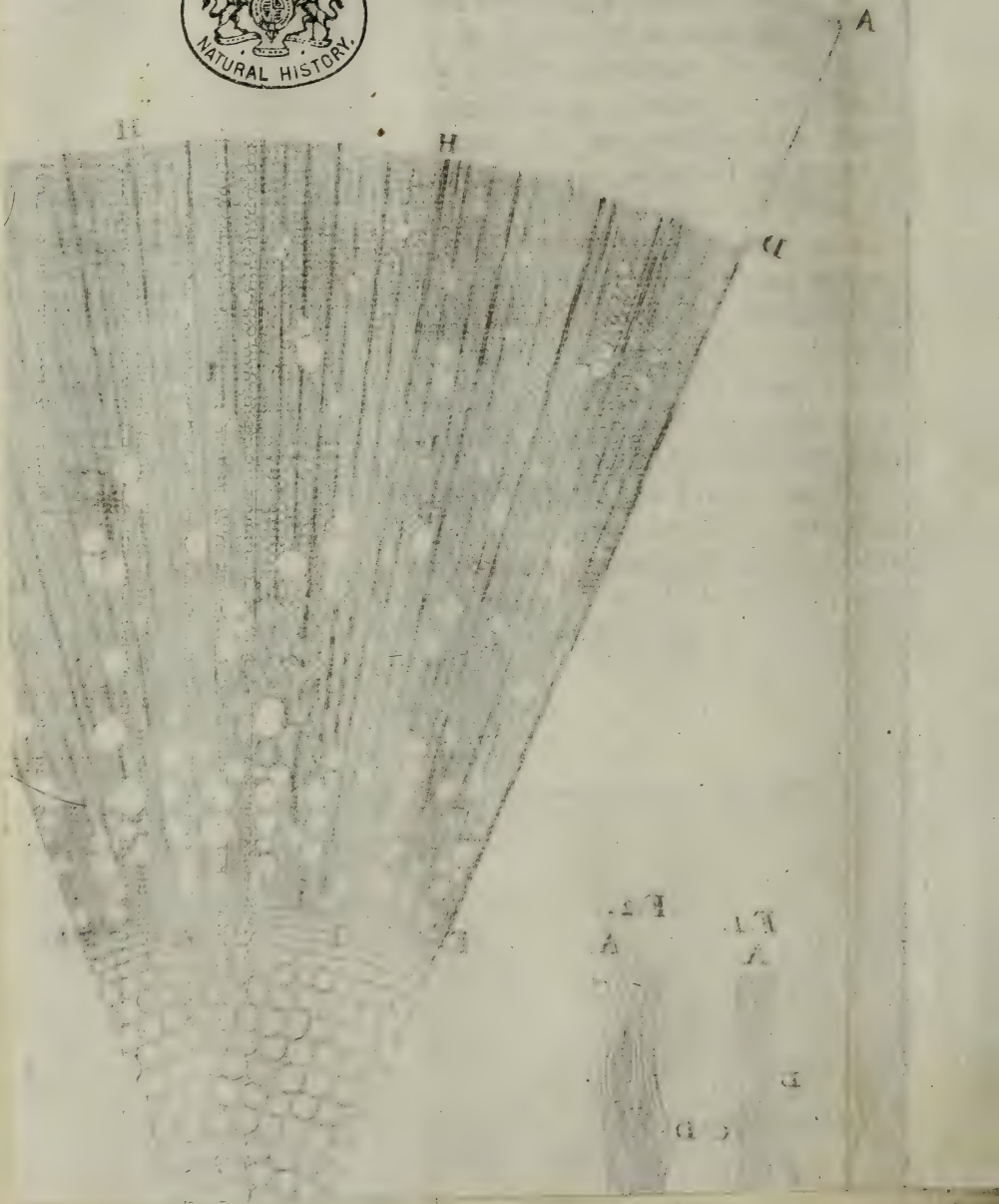


Fig. 2. A B exhibits ſome of the ſmall Veſſels that make up the (17)firm wood,cutt of cloſe to the Bark longways,likewiſe of an Aſh 17.
of one years growth , between the pipes of which theſe Veſſels are found; which have their riſe out of the pith of the plant or twig, and are, as I conceive , increaſed by more Veſſels, either out of the great or ſmall Veſſels that go directly upwards.(18) Of theſe Veſſels 18.
there lie 8. 10. or 12. together, crowded in long-ways between the aforeſaid pipes,as at C and D,in the manner of a Weavers-ſhuttle, lying in ſome places irregularly, the one cloſe by the other, and in other places ſomewhat more diſperſed.

Fig. 3. A B C D is (19) the Bark of the Twig, which I have only 19.
repreſented with bare lines, becauſe that now the plant is growing, Tab. II.
whereby the Bark is changed from what it is in Winter. And if one would give a pertinent and exact delineation thereof, it would be requiſite to obſerve it a fortnight together whilſt it is growing. And this might likewiſe be done with the *Wood*.

A H H D E G F is the Eighth part of the *Wood* of an Aſh twig,one year old, cutt tranſverſly ; wherein you may ſee, that it is not made up wholly of firm or cloſe parts,but partly too (20) of great 20.
Veſſels , which yet differ much among themſelves in bigneſs , and which are not at all, or ſeldom, perfectly round,ſtanding alſo near the pith in ſome places irregular by one another ; and the reſt of the Wood being an infinite number (21) of little Veſſels or pores. 21.

(22) G H,are Veſſels having their origin from the Pith, and termi- 22.
nating in the circumference of the Woody part , I mean, when the Tree is not growing. (23) Theſe Veſſels may not always be ſeen, 23.
in a tranſverſe Cut,to have their riſe out of G,and to end in the circumference H, becauſe that in the diſſection made with the knife you do not throughout keep juſt the middle of the body that takes hold of theſe Veſſels, from the place of the very beginning of them, but in one place,as about C in *Fig.* 2, you will cut through with its ſharp point,and in another place the ſame will paſs with its middle, as at D, where it is thickeſt ; and ſo it comes to paſs, that your eye ſees theſe Veſſels to have their beginning out of G,and run between G and H into nothing,and again,that the ſame do ſeem to have their beginning in the middle, and become ſtill broader and broader,untill they end in H.

I. I. Are (24) the very ſmall Veſſels that are counted to be the 24.
yrm Wood, and which require indeed to be more curiouſly deſigned ; but to expreſs them in their natural perfection and order , juſt as they lye by one another , in my opinion , can never be done by the hand of Man.

E K F Is the *Pith* of the twig, which likewiſe cannot be imita-
25. ted by art, foraſmuch as it conſiſts of Veſicles or (25) bladders
that have 6. 7 or 8 ſides, and lye moſt curiouſly with their ſides to
26. one another: In ſome of which bladders I have ſeen ſmall (26) darkiſh
globuls; and if I had not in ſome other Wood more plainly diſ-
covered theſe globuls, it would have been impoſſible for me to have
27. obſerv'd them in this Pith by reaſon of their (27) extraordinary
ſmalneſs.

I beg your favour, Sir, to communicate this to Dr. *Grew*, with my ſervice to him, and to inquire of him, whether he hath ſeen as well as I, whether the great Veſſels or pores, that are expreſt by him in his figures, do not conſiſt of globuls, as in *Fig.* 1. A B; as alſo that in the ſame do lye oblique membranes or films, by me call'd valves, as C C. D D; again, whether the particles of the Wood, which encompaſs the great Veſſels, be not all of them very ſmall Veſſels or pores; laſtly, whether the ſtrokes, which in *Fig.* 3. are denoted by G H, coming out of the pith, and running horizontally to the circumference, do not alſo all of them conſiſt of Veſſels or pores; as theſe
Tab. 2. alſo, which in *Fig.* 2. are cut off along the Wood, and run through the ſaid Veſſels, as C D? An anſwer to which particulars I ſhould be very glad to receive from the ſaid Doctor.

I have now ſome *French* Wine of the growth of the year paſt, which hath a very delicate taſt. The Veſſel, wherein this Wine is, was very good and ſweet when the Wine was put in, and a coarſe linnen Cloath dipt in melted Brimſtone and kindled had been hung over the Veſſel before it was filled. In this Wine I have divers times obſerved ſmall living Creatures, ſhaped like little Eels, as ap-
Tab. 2. pears in *Fig.* 4. A B, having on their forehead a round convexity like a creſcent, without having any thing elſe, that I could ſee, on the forepart of their body, and that part looked no otherwiſe than cryſtal; but towards its middle it was made up of nothing but globuls, which I could very plainly diſcern; and the hinderpart of the body of theſe little Animals appeared as clear and tranſparent as the fore-part, and running to a very ſharp tayl. Theſe creatures I have kept in my Study for a whole month ſwimming in Wine. And though they move ſtrongly, yet they make but little way, whereof the cauſe may be, that they are quite deſtitute of leggs.

Some Notes on the foregoing Letter.

Theſe Obſervations, *as to the Texture of Plants, although they (and very many more) have been already made and publiſhed by Dr.* Grew, *and by Sign.* Malpighi; *yet becauſe that (for the moſt part) they*

may

may be a further Confirmation of the truth of their Observations; I thought it not unuseful to have them communicated here also. And withal, to subjoyn to the principal Passages hereof, the following Remarques.

1. two sorts of Vessels] *These two sorts of Vessels are described by Dr.* Grew *in his* first and general Anatomy of Plants, *in his* Anatomy of Roots, *and in his* Anat. of Trunks.

2. in the greater Vessels sent upwards] *The chief use, whereto Dr.* Grew, *in his said 3 Books, assigneth these Vessels in all parts, is not the conveyance of Sap, but of Air. And herein Sign.* Malpighi *doth agree with him. See* him in his Anatome Plantarum de part. Caulem componentibus. *Yet in some few Plants, and at some certain times of the year only, Dr.* Grew *sheweth, that the said Air-Vessels do contain an Aqueous Sap; and how it comes to pass, see his* Anat. of Trunks p. 2. Ch. 1. and pag. 26.

3. a Circulation] *Dr.* Grew *in his aforesaid* first Book *speaketh conjecturally of a Circulation; not in the Trunk, but in the Root only: And that not by Vessels of a different, but the same* Species, *sc. Sap-Vessels, some whereof running through the Pith, by which chiefly the Sap may ascend, and some through the Bark, by which part of the Sap may descend. See* Ch. 2. of that book.

4. two sorts of Vessels in the Woody part] *These two sorts of Vessels are, as was said, distinctly and largely described by Dr.* Grew; *as you will find particularly in his* Anat. of Trunks p. 22. to 30. *And the Explications of all the Figures do plainly distinguish the Air-Vessels from the Sap-Vessels. The pores, or mouths of which Sap-Vessels, are for their incomparable smallness, represented only in* figure the 18. *where they are very much wider than ordinary. See also* p. 25. of that Book.

5. a third sort —— going horizontally] *These parts, which Mr.* Leewenhoeck *calls a* third sort of Vessels, *Dr.* Grew *calls the* Insertions, *and hath largely described them in all his 3 Books; particularly, in his* Anat. of Trunks, p. 20, 21, 22; *and hath clearly expressed them in almost every figure of that Book, sc. by* white *diametral lines (more agreeable, as he conceiveth, to Nature) which Mr.* Leewenhoeck (Fig. 3. G H.) *hath expressed by* black. *These parts* Tab. 2. *he demonstrateth, especially from Herby Plants, to be of the very same substance with the Pith. Wherein Sign.* Malpighi *doth also most clearly agree with him: See his* Idea Anat. Plant. p. 3 l. 3.

Of these Insertions *it is by Dr.* Grew *further remarked, that they consist of a number of most exquisitely small Fibres; which in all less Woody, softer and younger Plants, are Woven up together into extream*

small Bladders: Which Bladders, Sign. Malpighi *hath likewise observed, calling them* utriculos: *See him in the forecited place: But not, their being composed of such Fibres. These Bladders, being (in cleaving a Branch) many of them cut open, Dr.* Grew *tells me, he conceiveth, may be taken by Mr.* Leewenhoeck *for the* Mouths *of Vessels. But in most hard Woods, the Bladders* he saith, *are scarcely to be seen; the said Fibres being so closely couched and drawn up together, as to lye rather after the Manner of the Vessels in the Liver, Testicles, Glands, and other* Viscera *in Animals.*

6. the whole body of Wood —— consists of Pipes] *Dr.* Grew *hath formerly gathered upon probable grounds, that not only the Wood, but that the whole of a Plant, doth consist of Pipes. See his* Anat. of Roots. part. 2. Ch. ult. *and* Anat. of Trunks p. 18. and p. 34. 35. *See also the* latter Paragraph *of the* Note 5.

7. as clear as Crystall] *The same Dr.* Grew *hath said in his* Anat. of Roots, p. —— 114.

8. of small Globuls] *Dr.* Grew *hath given a further and more particular Description of the Structure of these Vessels;* Anat of Roots p. 89. *and* Anat. of Trunks p. 30. *and* fig. 24. *Which, if well minded, will give you the reason, why they seem, especially in Vines, Oak, and some other Plants, to consist of Globuls.*

9. Valves] *Of the same appearance of pithy Valves, Dr.* Grew *maketh mention in his* first book *of the* Anatomy of Plants p. 71. *at the beginning,*

But that in the Sap Vessels there are no Valves, he proveth by divers arguments: See his Anat. of Trunks p. 45, 46. *The same person doth also acquaint me, that he hath made some experiments, whereby he proveth, that there are no Valves neither in the Air-Vessels: Which I suppose he reserveth to be Published together with further Observations upon Plants.*

10. these three sorts ———] *These three general Parts Dr.* Grew *hath, as is said, described and represented in several Figures, shewing the different Texture of so many several sorts of Wood. See* Anat. of Trunks p. 20. to 30. *compared with the* Figures *and the* Explication of the same. *But for what he saith of one of the said three parts, (which Mr.* Lewenhoeck, *calls a third sort of Vessels) see the Note* 5.

11. of one Sort] *Dr.* Grew *hath both described, and by his figures* (Anat. of Trunks) *represented two sorts of Vessels, in the Wood of Ash, and divers other Trees. But all these Vessels, whose pores or mouths are represented, are indeed of one sort only; excepting in the* 18. Figure; *which made Mr.* Leewenhoeck (*for want of skill in the English*

liſh tongue to have recourſe to the explications,)*to conceive, there were no other repreſented at all And for* Fig. 18, *that being but one (which the Author thought ſufficient for examples ſake) amongſt ſo many more figures, Mr.* Leewenhoeck *did, it ſeems, overlook it. See the latter end of the Note* 4.

12. of which] *The Cauſes of which, are aſſigned and explicated, in Dr.* Grews Anat. of Trunks, part. 2. Ch. 5. *And of a great many more particulars throughout the whole Occonomy of Vegetation in all the aforeſaid three* Books.

13. tranſparent Globuls] *See the* Note 8.

14. called Valves] *See the* Note 9.

15. of the Small ones] *of the ſize of theſe Valves, ſee Dr.* Grews *computation,* Anat. of Trunks p. 18. 19.

16. conſiſt of Globuls] *See the* Note 8.

17. firme Wood] *Dr.* Grews *Deſcription whereof, ſee* Anat. of Trunks, p. 22. to 26.

18. of theſe Veſſels] *See the* Note 5.

19. the Barke] *See Dr.* Grews *Deſcription and Repreſentation of the Bark in his* Anat. of Trunks. *And of this very Barke,* fig. 15. *with the Explication And it is further to be noted, That the ſame Author, in his* Anat. of Trunks, *informeth us, that there are two ſorts of Veſſels Viſibly diſtinct in the Barke of moſt, if not of all, ſorts of Trees and other Plants, as well as in the Wood. Wherein Sign.* Malpighi *doth alſo agree with him, at leaſt, that they are to be found in many Trees of two diſtinct ſpecies; ſee him in his* Idea, p. 2. *towards the end. And Dr.* Grew, *moreover, both obſerveth, and ſheweth three diſtinct ſpecies of Veſſels, even in the Barke, of ſome Plants. See* Anat. of Trunks p. 14 to 17. *and* figures 19, 20, 21.

20. of great Veſſels] *Which Dr.* Grew *calleth the Air-Veſſels,* (Malpighius, Fiſtulas ſpirales) *and deſcribeth* Anat. of Roots and Trunks p. 26 to 30.

21. of little Veſſels] *Which Dr.* Grew *calls the True Wood, or Old-Sap-Veſſels, deſcribed in his* Anat. of Trunks p. 22 to 26.

22. G H the Veſſels] *See the* Note 5.

23. theſe Veſſels may not alwayes —— untill they end in H] *See the ſame thing obſerved in Dr.* Grews general Anat. of Plants. *And an Example of the ſame in the Wood of* Sumach, Anat. of Trunks Fig. 20; *that being of a Branch of the firſt years growth, (as is Mr.* Leewenhoecks,) *wherein it is much more obſervable than in older Branches. The cauſe hereof is that which Dr.* Grew *calls the* Braces, *and Sign.* Malpighi, *the* Superequitations, *of the Veſſels.*

24. the

24. the very small Vessels] *The same with those mentioned* Note 21.

25. Bladders] *See Dr.* Grews *Description of the Pith, and therein of these Bladders*, Anat. of Roots part. 2. *And* Anat. of Trunks, part. 2. Ch. 4.

26. darkish Globules] *See the same* Ch. p. 34.

27. Extraordinary smallness] *See the same* Ch. 32, 33 *Note, that these Bladders, whereof the Pith consists, Sign.* Malpighi *doth also observe; but not the Fibres, of which Fibres (most admirably Woven up-together) Dr.* Grew *hath discovered the said Bladders to be composed. See the same* Ch. p. 35.

Eclipsis Solis
Anno 1675, die 23 *Junii* mane *st. n.* observ.
GEDANI,
à
Joh. Hevelio.

UT *non omnes & singulas phases in hâc Eclipsi, ab ipso initio, ob frequentissimas densissimasque Nubes hîc* Gedani *observare nobis obtigerit; attamen præcipuas crescentes ex voto annotare licuit. Sol oriens clarissimus quidem extitit, sic ut ipsum initium admodum distinctè, hor. sc. 4. 44', deprehensum fuerit; paulò autem pòst, horâ sc. 5. 6' nubes Solem nobis planè eripiebant, ut nihil quicquam ad horam usque 5. 32' deprehendere licuerit, ut ut vigiles semper oculos ad Tabulam observatoriam direxerimus. Ex improviso tamen præter omnem spem, horâ, ut dixi, 5. 32' nubes Solem rursus deferebant, ut ejus Phases omnes subsequenter, à 1 ad 23, uti ex Schemate liquet, accuratè describere potuerim. Prior phasis ante maximam obscurationem adhuc annotata est; maxima namque obscuratio circa tertiam phasin, horâ videlicet 5. 39'. primùm incidit, prout pariter ex ipso typo videre est; Finis contigit hora 6. 33'. 30". Quantitas Eclipseos observata est 6 digit. 42', ad 37' scilicet major, quàm calculus* Rudolphinus *eam promiserat; imò Initium & Finis satis evidenter secundùm dictum calculum in hac Eclipsi aberravit; quippe liquidum est, ad 12 integra ferè minuta tardiùs incidisse: Semidiameter quoque Lunæ calculo hâc vice non respondet; siquidem circa hor. 5. 55', alto scilicet Sole 15° ferè, Semidiam. Lunæ non nisi 14'. 37" extitit; cùm tamen calculus eam 15'. 29" monstraverit, datâ nempe semidiametro Solis 15'. Hæc sunt, quæ observata in hâc Eclips. fuêre.*

Calculus *Rudolphinus.*	Hor.	'	"	Observatio. Hor.	'	"	Differentia.
Initium *Gedani*,	4	31	42	4	44	0	12
Maxima obscur.	5	28	20	5	39	0	11
Finis,	6	24	58	6	33	30	9
Duratio,	1	53	16	1	50	0	3
Quantitas,	vj. *digit.*	5'		vj. *dig.*	42'		37

Eclips.

Eclipſ. Sol.
Anno 1675, die 23 *Junii* obſerv.
GEDANI.

Ordo Phaſium	Animavertenda.	Temp. ex ſciat. Hor.	′	″	Tempore Correcto. Hor.	′	″
	Solis centrum in horizonte,				3	21	30
	Nihil in Sole,				3	56	30
	Sol ſub nubibus,				4	6	0
	Nihil in Sole,	4	35	0	4	35	0
	Nihil in Sole,	4	37	0	4	37	10
	Nihil in Sole,	4	40	0	4	40	0
	Nihil adhuc,				4	42	0
	Initium,				4	44	0
	Nubes Solem planè occultarunt,				4	54	30
	Sol nuſquam apparuit,				5	6	0
1	$6\frac{1}{2}$ *digiti ferè obſcurati erant, cùm Sol rurſus emicuit.*				5	32	0
2	$6\frac{2}{3}$ *digit.* dig				5	34	0
3	*Maxima ferè obſcurat.* 6	42′			5	38	50
4					5	40	30
5					5	42	0
6	$6\frac{1}{2}$ *digit.*				5	43	30
7	$6\frac{1}{4}$ *digit.*				5	47	30
8	6 *digit.*				5	49	30
9	$5\frac{1}{2}$ *dig. Diamet.* ☽ᵉ, 14′ 37″				5	55	0
10	$5\frac{1}{4}$ *dig.*				5	57	0
11	5 *ferè digit.*				5	59	30
12	$4\frac{5}{8}$ *digit.*				6	2	0
13	$4\frac{1}{2}$ *dig.*				6	4	15
14	4 *digit.*				6	6	30
15	$3\frac{5}{8}$ *dig.*				6	9	15
16	$3\frac{1}{2}$ *dig.*				6	14	35
17	$2\frac{1}{8}$ *dig.*				6	18	10
18	$2\frac{3}{8}$ *dig.*				6	20	0
19	2 *dig.*				6	22	0
20	$1\frac{1}{2}$ *dig.*				6	24	0
21	$1\frac{1}{4}$ *dig.*				6	25	25
22	1 *dig.*				6	27	10
23	$\frac{1}{2}$ *digit.*				6	30	30
	Finis.				6	33	30
		Altitudo ☉.					
		°		″			
	Altitudo ☉	25	20	0	6	41	22
	Altitudo ☉	26	36	0	6	50	4
	Altitudo ☉	27	40	0	6	57	22
	Altitudo ☉	28	5	0	7	0	14

So far the Learn'd *Hevelius*; who was alſo pleaſed to communicate his Obſervation of the Figure of *Saturn*, as it appeared to him in *Auguſt*, 1675. to be ſeen in *Tab.* I. *Fig.* 3.

Mr.

Mr. *Flamstead*'s Letter, concerning his Observations, and those of Mr. *Townley*, and Mr. *Halton*, of the late Eclipse of the Sun.

UT *datam fidem liberem*, *promissas*, *Clarissime* Oldenburgi, *nuperæ Eclipsis observationes ad Te mitto*; *nec meas duntaxat*, *sed & Amicorum accuratas*, *quibus cùm cœlum fuerit serenius*, *non solùm* Initium, *sed* Maxima obscuratio, Finisque *fuere distinctè conspecta: Has itaque breviter sic accipe*; *nostrasque*, *si placet*, *primùm*.

Eclipsis hujus observationem ut videret, *pridie huc descenderat Amplissimus Rei Tormentariæ Supervisor*. *Sed cùm inde ab ortu solis usque ad horam septimam manè nubes densissimæ cœlos undequaque subtexissent*, *nullam ei futuram serenitatem crédens*, Londinum *reversus est*, *antequam illæ debiscere ceperint*; *Quæ licèt nobis initium cum omnibus phasibus post hor.* 8. 40′ *surripuerint*, *satis tamen permisêre*, *ut Lunæ locum visibilem & latitudinem obtinerem*, *etsi diametrum ejus investigare accuratè non licuerit*; *quippe Nubes sub Solem frequentissimè redeuntes*, *ventusque aliquando impetuosior Tubos nonnunquam concutiens*, *destinatas in hunc finem observationes difficiles & minus certas reddidere*. *Hisce observationibus peragendis socium acciveram amicum meum* Ed. Halleium. *Tubos præparaveram duos*, *alterum digitos* $196\frac{1}{2}$ *longum*, *quocum & Micrometro* Townleiano *Ego ipse octo phasium priorum cepi mensuras*; *alterum*, *digitorum duntaxat* 103_2 *quocum & Micrometro* meo, *iis adscriptas mensuras* Halleius *cepit*: *In duabus tamen ultimis animadversionibus*, Ego *minori tubo & Micrometro meo* (*in hunc usum altero accommodatiore*) *distantiam cepi* Azimutharum, *per Solis limbum lucidum*, *& cuspidem proximam Eclipsis decidentium*; Halleio *interea partes lucidas & cuspidum distantiam majori Tubo dimetiente*. *Paulo ante initium advenerat Nobilissimus Præses* Regiæ Societatis *Dom. Vice-comes* Brouncker, *qui mensuram diametri Solaris*, *Tubo longiori captam*, *suo judicio probavit*. *Horâ* 7. 45′ *Sol primum per Nubes apparuit*. *Observata deinde sic se habuerunt*:

Phas. ordo.	Hor. horolog. oscillatorii. h. ′ ″	Correcta. h. ′ ″	Longiori tubo.	Breviori. V. Tab. I. Fig. 4.
	7.46.00	7.45.00	*Nulla eclipsis. Nubes protinus succesêre.*	
	7.50.00	7.49.00	*Nec etiamnum. Nubes iterum.*	
1	7.54.50	7.53.50	*Solis eluctati è Nubibus margo dexter eclipsatus apparuit.*	
2	7.58.24	7.57.24	I C . . 2040 = 10′ 10″	
3	8.04.12	8.03.12	I C . . 2773 = 13 56	
4	8.13.40	8.12.40	I C . . 3580 = 17 52	P L 3198 = 26.18
5	8.18.37	8.17.37	P L . . 4975 = 24 50	I C 2334 = 19.13
6	8.21.06	8.20.06		P L 2989 = 24.35
			Sol. diameter, 6360 = 31 43	3850 = 31.40
7	8.28.01	8.27.01		P L 2888 = 23.57
8	8.29.01	8.28.01	P L . . 4565 = 21 46	
9	8.35.12	8.34.12	P L . . 4478 = 22 18	A Z 2310 = 19.00
10	8.40.20	8.39.20	I C . . 4417 = 22 00	A Z 2070 = 17.02
			Sol deinceps sub nubibus receptus latuit usque ad =	
	10.02.00	10.01.00	*Emergentis limbus per Nubes defectu liber apparuit*,	
	10.04.00	10.03.00	*Prodibat clarius*, *& nihil in ejus limbo deficere compertum.*	

Pro

Pro correctione horologii, acceperam pridie Eclipsis, Maii 31 *Mane*
Hor. horologii.

h. ′ ″		° ′	h. ′ ″	′ ″
7.07.12	altitudinem limbi Solis infer.	27.47 hor. sup.	7.06.09	—— 1.03
10.16	ejusdem limbi	28.16 ——	7.09.19	—— 0.57

Iterumque Junii 1. *p. m.*
Hora horolog.

h. ′ ″		° ′	h. ′ ″	′ ″
5.32.02.	altitudinem limbi Solis infer.	22.06 hor. inde	5.31.06	—— 0.56
35.23.	limbi Superioris	22.06 — —	5.34.34	—— 0.49
45.17.	Inferioris	20.06 — —	5.44.18	—— 0.59

Denique Junii 2. *Mane.*
Hor. horol.

h. ′ ″		° ′	h. ′ ″	′ ″
8.09.44.	altitud. limbi Solis inferioris	37.34½ hor. sup.	8.08.45	—— 0.59
13.36—	——	—38.09——	8.12.34	—— 1.02
15.44——	——	—38.28——		
17.51—	——	—38.47——		
20.01——	——	—39.07——	8.18.49	—— 1.11

Unde liquet, & motûs constantiam servâsse horologium, & in Eclipsi debitè fuisse correctum.

Ejusdem Eclipsis observationes, habitas à Præstantissimo Dom. Richardo Townleio, *Armigero, amico meo dignissimo (Micrometri, à me frequentissimè usitati, Inventore,) Ipse ad me, in epistola, eodem die datâ, modestius, pro more suo, descriptas. misit, in hunc ferè sensum:*

Cœlum ante Eclipsin valde fuit pluviosum. Attamen, nisi de futura serenitate desperassem ferè ipsum Defectus Initium non minùs accuratè quàm Finem observare, credo, licuisset. Omnino certas esse omnes has observationes, asserere non ausim; quippe nubes frequentissimè Solem subtercurrentes, ventusque validior tubum aliquando quatiens, haud utique justus capi mensuras sivêre. Accessit & aliud infortunium, quòd, cùm Phasium captas mensuras, binis partibus, duobus Micrometri locis ostensas, retro numerarem; servus, cui scribendi negotium demandaveram, vitiose aliquando eas descripsit; quod tamen percepi, & correxi, credo. Quales quales sint observationes, tui esse juris jubeo. Tab. I. Fig. 5.

Hora horol. oscillatorii.			Correct. per lin. merid.			Mensuræ Phasium.				
h.	′	″	h.	′	″			′	″	
8	06	45	8	08	27	A B	1190	16	09	forsan 1109 = 14 50
8	11	00	8	12	42	C D	1935	26	15	
	18	00		19	42	A B	1405	9	04	
	21	00		22	42	C D	1805	24	30	
	26	14		27	56	A B	1504	20	47	
	34	00		35	42	C D	1711	23	13	
	42	15		43	57	A B	1551	21	03	accuratè.
	46	30		48	12	C D	1702	23	20	vel 1720 = 23 15

Hor. horol.			Correcta.			Phas. Mensuræ.			
h.	′	″	h.	′	″		′	″	
8	51	45	8	53	27	A B 1553	21	04	accuratè.
9	00	00	9	01	42	C D 1809	24	33	
9	12	34	9	14	16	A B 1357	18	25	
9	30	55	9	32	37	A B 872	11	50	
9	41	15	9	42	57				

Præcisè. Desiit Eclipsis, quantum per aeris vibrationem potui discernere. Exitûs locus adeò vertici vicinus erat, ut, in quam ab ea partem inclinaret, bene non potuerim definire; etiamsi hora 9. 29′ per horologium Cuspides horizonti apparerent parallelæ.

Solis diameter hora 9. 10′ erat 2334; satis, ut putavi, præcisè.

Deinde, accedente Sole ad Meridiem per lineam longam Meridianam, horologium justo tardius inventum fuit scrupulis 1′ 42″. Magno tamen Æquinoctiali sciaterico, quo medias minoresve scrupuli horarii partes possum distinguere, horologium toto hoc manè tardius duntaxat 45″.

Lineam longam Meridianam iterum primâ occasione examinabo. Interea correctioni per hanc factæ potius quàm sciaterico fidendum puto.

Townleii *Latitudo observata (ut ad me scribit)* 53°. 44′; *Longitudo à Meridiano* Londinensi *9 circiter scr. hor. ad occasum.*

Wingfeldiæ, *decem circiter milliaria citra* Derbiam *ad Boream, sub latitudine* 53°. 08′ *eandem observavit Eclipsin Amicus meus Singularis* Immanuel Halton, *Armiger, hoc modo*;

h.	′	
7	50	Nihil sub Sole.
7	50½	Initium accuratè.
7	52	Notabilis defectus.
9	00	Digiti 3½.
9	11	digiti 3$\frac{1}{10}$.
9	21	digiti 2$\frac{1}{100}$.
9	47½	Non finita; imminente fine.

Hæc sub scena, & in obscurato cubiculo, pro more doctissimi Hevelii, *observavit. Vale. Dab.* Genovici, *Julii* 10. 1676.

Signor Cassini's *Letter of the same Eclipse of the Sun.*

Clariss. Viro

Dom. Henrico Oldenburg,

Reg. Societati à Secretis

J. D. Cassinus, *S. P.*

IN nupera Solis Eclipsi nonnisi per hiatus nubium ter vel quater, ac brevibus intervallis Solem conspicere potuimus; itaque nec ejus Principium, nec Finem habuimus immediatè.

Sed eæ angustiæ observandi methodum mihi suggessere, quâ tribus vel quatuor temporis minutis tot percipere observationes potui, quot sufficiunt determinando Lunæ loco apparenti, ejusq; diametro, ac Eclipsis quantitati; indèque alias Eclipsis phases, quas immediatè observare non potui, deducendo. Scilicet, cum Sol è nubibus emergeret, alti-

altitudinem graduum 48 *accedens, ad eum direxi Quadrantem, quem ad hanc altitudinem immotum tenui; Vid.* Tab. I. Fig. 6.

Ex quo, Solis margo superior a *tetigit filum horizontale* c d *in foco Telescopii; ad adventum centri* b *fluxêre secundæ horariæ* 104. a b, *vel,* b r.

A transitu centri b *ad transitum marginis Lunæ superioris* o, *secundæ* 11. b s.

A transitu centri b *ad cornu superioris occidentalis* e *fluxêre secundæ* $25\frac{1}{2}$. e h.

A transitu centri ad transitum cornu inferioris et orientalis l, *secundæ* 93. i k.

Hinc determinatur linea cornuum i e (*secluså variatione*) *ejusque inclinatio ad horizontem* l k; *et punctum* p *concursus tangentis Lunam cum secante* i e p, *et tangens ipsa* p o *Media proportionalis inter* p i, p e: *et anguli* n o e, t o i; *hinc angulus* i o e *et; triangulum* i o e *Lunari circumferentiâ inscriptum, quem maluissem minus* Scalenum, *si in mea potestate fuisset electio.*

Ex iis, aliisque ex Astronomia datis, deduxi

Initium *esse debuisse* Parisiis —— h. 7. 55'.

Finem *verò* —— —— h. 10 12 *vel circiter.*

Quod video satis convenire observationi Domini Smethwickii *vestri, reductione factâ non solùm per meridianorum, sed etiam per parallaxium differentiam. De ea mihi communicatâ magnas tibi gratias ago; ex ejus namque collatione cum meis numeris et delineationibus incredibilem voluptatem percepi.*

Aderat observationi D. Bernardus, *aliique tres ex* Regiâ Societate, *qui frequenter in Observatorium venire solent, meque eruditis colloquiis recreare. Vale, Vir clarissime, et siquas alias nactus eris de hac Eclipsi observationes, mihi impertiri ne graveris.*

Paris. *die primo* Julii 1671.

P. S.

Habemus in Sole satis ingentem Maculam, quæ Solem ipsum mediavit die 28 Junii *h.* 4. *post meridiem, cum latitudine Australi* $4'\frac{1}{4}$; *ejus distantiam à polo Australi Solis ex pluribus observationibus supputavi gr.* $78\frac{1}{4}$. *Si satis habuerit consistentiæ ad absolvendum circulum, expectanda restitutio ejus ad medium diei* 25 Julii, *vespere, cum majore latitudine Australi.*

Monsieur Hevelius *his Observations of the same Eclipse.*

Eclipsis Solaris observata *Gedani*
Anno 1676, die Jovis 11 *Junii* ante Merid. *St.n.*
à
JOHANNE HEVELIO.

Temp. juxta Sciatericum & hor. oscill	*Altitudines* ⊙.	*Tempus ex Altitud. Sol. correct.*	Ordo Phasium	*Magnitudo Phasium.*	*Animadvertenda.*
Ho. ′ ″	° ′ ″	Hor. ′ ″		Digit.	
7 58 10	36 17 0	7 58 18			
8 1 30	36 41 0	8 1 6			
8 3 30	37 3 0	8 3 39			(ruit.
8 50 30		8 50 0			*Sol omninò purus adhuc appa-*
9 21 30		9 21 0			*Nihil adhuc in Sole.*
9 22 30		9 22 0	1		*Initium Eclipseos.*
9 24 10		9 23 40	2	$\frac{1}{8}$ *ferè.*	
9 24 55		9 24 25	3	$\frac{1}{3}$ *digit.*	
9 27 28		9 27 0	4	$\frac{2}{4}$ *dig.*	
9 29 40		9 29 10	5	1 *dig.*	
9 33 25		9 33 0	6	$1\frac{1}{4}$ *dig.*	
9 36 75		9 36 5	7	$1\frac{1}{8}$ *ferè.*	
9 39 35		9 39 10	8	2 *dig.*	
9 45 49		9 45 25	9	$2\frac{1}{2}$ *dig.*	
9 54 22		9 54 0	10	$3\frac{1}{8}$ *dig.*	
10 3 44		10 2 22	11	$4\frac{1}{2}$ *dig.*	
10 8 30		10 3 20	12	$4\frac{3}{4}$ *dig.*	
10 18 17		10 18 0	13	$4\frac{1}{8}$ *ferè.*	
10 22 42		10 22 22	14	$4\frac{1}{2}$ *& paul. plus*	
10 26 19		10 26 0	15	$4\frac{1}{3}$ *ferè.*	*Hor. 10. 31′. 0″ ferè Max.*
10 35 24		10 35 6	16	4 22′	*incidit obscuratio.*
10 38 53		10 38 38	17	$4\frac{1}{4}$ *ferè.*	
10 47 34		10 47 20	18	4 *dig. ferè.*	
10 53 49		10 53 30	19	$3\frac{5}{8}$ *dig.*	
10 58 17		10 58 8	20	$3\frac{2}{8}$ *dig.*	
11 5 27		11 5 20	21	$2\frac{7}{8}$ *dig.*	
11 8 50		11 8 44	22	$2\frac{1}{4}$ *dig.*	
11 22 13		11 22 8	23	$1\frac{3}{4}$ *ferè.*	
11 29 14		11 29 10	24	$1\frac{1}{10}$	
11 35 25		11 35 20	25	$\frac{1}{2}$	
11 36 59		11 36 55	26	$\frac{1}{4}$ *& paul. plus*	(*purus extitit.*
11 37 55		11 37 53	27		*Nondum Sol. omninò*
11 38 35		11 38 35			*Nondum.*
11 39 15		11 39 15			*Nondum.*
11 39 40		11 39 40			*Finis Eclipseos.*
4 18 10	33 11 0	11 18 19			
4 20 0	32 25 0	11 20 36			

Ex

	Ex Calculo Rudolph.			Ex Obſervat.			Differ.		Tempus.		
	Hor.	′	″	Hor.	′	″	′	″	Hor.	′	′
Initium	9	22	26	9	22	0	0	26			
Max. Obſcur.	10	17	57	10	31	0	13	3			
Finis	11	13	26	11	39	40	26	14			
Dig. Eclipſ.	4	21	30	4	22	0	0	30			
Semid. ☉	0	15	0								
Semid. ☽	0	15	3	0	13	53	1	10	10	0	0
				0	14	0	1	3	10	24	0
				0	14	50	0	13	11	0	0
				0	15	0		0	*ultimo.*		
Duratio	1	50	58	2	17	40					

An Extract of a Letter of the Learned Dr. Matthias Mangold *of* Baſel, *concerning a* Mathematico Hiſtorical Table, *deſigned in that Univerſity; together with a Deſcription of the import of the ſame.*

——CÆterum, hanc mihi inſuper indulgeo licentiam ut ſuper Tabula Mathematico-hiſtoricâ, à Clariſſimo *Megerlino*, Matheſes apud nos Profeſſore non contemnendo, adornata (cujus Deſcriptio inclusâ ſcedulâ continetur) tuam flagitem judicium, et quid de ea apud vos ſperare liceat.——

Baſileæ 4 Non *Martii* MDCLXXVI.

Tuus
Matthias Mangold.

Deſcriptio
Tabulæ Mathematico-Hiſtoricæ.

AD imitationem Geographorum, qui typum totius Terrarum Orbis unicâ Tabulâ repræſentant, omnia totius Mundi ſecula ad noſtrum uſque elapſa, omniumque Gentium Hiſtoriam, unicâ Tabulâ, *memoriæ juvandæ causâ, ob oculos ponere conatus ſum idque, ut omnes hiatus evitentur, quàm commodiſſimè fiere poſſe putavi, ſecundùm* Revolutiones Conjunctionum & Oppoſitionum Magnarum *Saturni & Jovis ad Trigonum Igneum; quarum ſingulæ octingentos annos complectuntur, ac* ſeptem Revolutiones, *ceu ſeptem Mundi ætates, omne ævum ab Orbe condito uſq; ad noſtrum ſeculum exhauriunt: Ia Incipit à Creatione & Adamo: 2. ab Enocho: 3. à Noaho & Diluvio: 4. à Moſe, & Exitu ex Ægypto: 5. ab Eſaja, Captivitate Aſſyriaca, Olympiadibus, Romulo: 6. à Chriſto nato, & Auguſto, denique 7. à Carolo Magno, & Imperio Germanico* Tabulam *igitur* Mathematico-Hiſtoricam *quatuor foliis à ſiniſtra ad dextram conglutinatis,*

conglutinatis, per septem Columnas *concinnavi, longitudine æquales, octo secula à vertice ad calcem spatiis æqualibus comprehendentes; latitudine verò valdè dispares, prout materia historica paulatim crescens id exigebat:* Prima *enim &* Secunda *sunt admodum tenues, cum res antediluvianæ ferè sint incognitæ:* Tertiam *&* Quartam *(ut & reliquas omnes) subdistinxi in sua quasi latera, quorum illa quatuor, hæc quinque habet, res Ecclesiæ Asiæ, Africæ, & Europæ Orientalis atq; Occidentalis continentes; illa autem angusta, quia præter res Ecclesiæ reliqua ferè omnia sunt fabulosa:* Cum Quinta *Columna tempus Historicum incipit, ideoque latera habet satis lata, eaque sex; prioribus enim res Europæ Septentrionalis separatim traditæ, accedunt: Et hucusque* Prima Pars *Tabulæ se extendit.* Altera *à Christo nato ad nostrum seculum ex duabus solùm (scil.* Sexta *&* Septima*) Columnis latissimis constat, in multa latera, res Ecclesiæ, Germaniæ, Italiæ, Hispaniæ, Galliæ, Angliæ & Scotiæ, Daniæ & Sueciæ, Poloniæ, Ungariæ, Græciæ, Asiæ, Africæ, separatim exhibentia, divisis. Adjungi posset* pars Tertia, *rerum nostro seculo per Orbem gestarum. Omnes autem illæ Columnæ simùl ostendunt in margine Signa & Gradus Zodiaci, atque etiam annos Mundi, Periodi Julianæ, & Epochæ Christianæ, in quibus Conjunctiones illæ & Oppositiones Magnæ contigerunt; ac transversim distinctæ sunt in quatuor Trigonos Signorum, & horum quilibet in duo secula, quorum quodlibet seu quævis areola, quindecim lineolis describitur. At ne nimia rerum, quas tango, brevitas Lectorem destituat,* Indicem *Tabulæ addidi locupletissimum, cum personis ac rebus gestis Chronologiam & Authores historicos indicantem, qui Commentarii vices præstabit: Sed & alius accedit* Commentarius *brevis Chronologicus, in quo usus Chronologiæ in historicis ostenditur, & Ex. gr. Anacrisis Blondelli de Joanna Papissa examinatur; cum Appendice* Cyclorum Planetarum, *quibus mediantibus vera eorundem loca, & Eclipses Luminarium, ad sex mille annos ex Ephemeridibus nostri seculi facillimè depromi possunt.*

P. Megerlin.

An

An Account of ſome Books.

I. *Experiments, Notes, &c. about the* MECHANICAL *Origin of divers particular* QUALITIES: *Among which is inſerted a diſcourſe of the Imperfection of the Chymiſts Doctrine of Qualities; together with ſome Reflections upon the Hypotheſis of* ALCALI *and* ACIDUM: *By the Honorable* Robert Boyle *Eſq*; *Fellow of the* Royal Society. London, 1675. *in* 8°.

THeſe Tracts are a freſh proof both of the Noble Authors conſtancy in his kindneſs to Experimental Philoſophy, *and* of his ſagacity in giving a more intelligible account of Philoſophical ſubjects, than is commonly received in Schools. The Matters here preſented, by way of *Specimen*, do comprehend in a ſmall Number a great Variety; there being ſcarſe any one ſort of *Qualities*, of which there is not an Inſtance given in this ſmall Volume; Since therein Experiments and Conſiderations are delivered about HEAT and COLD, which are the chief of the four *Firſt Qualities*; about TASTS and ODORS, which are of thoſe, that being immediate Objects of Senſe, are uſually called *Senſible Qualities*; about VOLATILITY and FIXITY, CORROSIVENESS and CORROSIBILITY, which, as they are found in Bodies purely natural, are referrable to thoſe Qualities, that many Phyſical Writers call *Second Qualities*, and which yet, as they may be produced and deſtroyed by the Chymiſts Art, may be ſtyled *Chymical Qualities*, and the Spagyrical ways of introducing or expelling them may be referred to *Chymical Operations*, of which here is given a more ample *Specimen* in the Mechanical account of CHYMICAL PRECIPITATIONS. To all which are added ſome Notes about MAGNETISM and ELECTRICITY, which are known to belong to the Tribe called *Occult Qualities*, by dark Philoſophers.

Concerning theſe particular Qualities, the preſent deſign of the Excellent Author is chiefly, to give an Intelligent and Hiſtorical Account of the Poſſible *Mechanical Origination*, not of the *Various Phænomena* of them; though his *Secondary* end is to become a Benefactor to the *Hiſtory of Qualities*, by providing Materials for himſelf or others: And this hath made him not ſcruple to add to theſe, that tend more directly to diſcover the *Nature* or Eſſence of the Quality treated of, by deriving it from *Mechanical* principles.

ples, ſome others, coming in his way, that acquaint us with ſome luciferous *phænomena.*

And that the Reader may the leſs miſtake what is driven at in many of the Experiments and Reaſonings deliver'd and propoſed in theſe Notes about *Particular Qualities*, he acquaints him, that he hath taken upon him to demonſtrate, that the Qualities of Bodies *Cannot* proceed from any other Cauſes but *Mechanical*, but pretends only to prove, that they *may* be explicated by them, ſince what he needs to evince, is, not that the *Mechanical* Principles are the neceſſary and only things whereby *Qualities* may be explained, but that probably they will be found ſufficient for their explication; The making out of which, as ſhews the inſufficiency of the *Peripatetic* and *Chymical* Theories of Qualities, ſo it recommends the *Corpuſcularian* Doctrine of them.

Now, as to the Experiments and inſtances here imployed in treating of the *Origin* of Qualities, they are of *three* diſtinct ſorts. Some are brought to ſhew, that the propoſed Quality may be Mechanically *introduced* into a portion of matter where it was not before; Others, that by the ſame means the Quality may be notably *Varied* as to Degrees, or other not Eſſential attributes: Others laſtly, that the Quality is Mechanically *Expelled* from, or *aboliſh'd* in a portion of matter that was endow'd with it before; and a new one produced by the ſame operation. That the *firſt* ſort of Kinds of Inſtances may be uſefully employed in this Subject, hath no difficulty. As to the *Second*, Since the permanent *Degrees* as well as other Attributes of Qualities are ſaid to flow from, and do indeed depend upon, the ſame Principles that the Quality itſelf does, if eſpecially in Bodies Inanimat a change barely Mechanical does notably and permanently alter the *degree* or other conſiderable attribute; it will afford, though not a clear proof, yet a probable preſumption that the Principles whereon the Quality itſelf depends, are Mechanical. *Again*, if by a bare Mechanical change of the Internal diſpoſition and Structure of a Body, a permenent Quality, confeſſed to flow from its *Subſtantial Form* or Inward principle, be *aboliſhed*, and perhaps alſo immediately ſucceeded by a new Quality *Mechanically* producible; if, I ſay, this come to paſs in a Body Inanimat, eſpecially if it be alſo, as to ſenſe, Similar, ſuch a *Phænomenon* will not a little favour that *Hypotheſis*, which teaches, that theſe Qualities depend upon certain Contextures and other Mechanical affections of the ſmall parts of the Bodies that are indow'd with them; and conſequently

that

that may be observed when that necessary Modification is destroyed.

But having thus briefly shewed from the Author the pertinency of alledging differing kinds of Experiments and Phænomena in favour of the Corpuscular *Hypothesis* about the Qualities, we must refer for the *Particular* Subjects and Experiments to the Tracts themselves not daring to engage upon them here, because of their great number and choice, which neither these papers have room for, nor the Publisher leisure enough to contract them.

II. Th. Bartholinus *de PEREGRINATIONE MEDICA &c.* Hafniæ, 1674. *in fol.*

THis famous Author makes it his business in this Discourse to counsel and instruct some of his learned Relations, what to do and observe in their Travels in reference both to Health and Philosophy. In order to which he premises a considerable number of Examples of Ancient Travellers, who by their Conversation with knowing and wise men abroad, have exceedingly improved their understanding, and acquired very beneficial Experience; such as were *Apollonius Tyanæus*, *Anacharsis*, *Pythagoras*, *Democritus*, *Plato*, *Hippocrates*, *Galen*, *&c.* To which he adds the advantage that may be gained by modern Travellers in such Countreys that abound with Learned and Knowing men, in which he tells us he travelled himself, *viz. Italy*, *England*, *France*, *Germany*, *Holland*, *Denmark*, *Sueden*. In these Countries he directs young Physicians what to observe both as to Things, and Men; of both which he discourses promiscuously. So that he would have them take notice of the constitution of the Air; the nature of the Soyl; the qualities of Medical Waters; the vertues of Herbs; the Diet, Diseases, and methods of Curing them; together with the Chyrurgical operations, Pharmaceutical compositions and Chymical discoveries. Particularly commends *England* for Experimental Philosophy; and subjoyns some of the Observations, formerly made by himself in his Travels in *Italy* and *Sicily*, naming also the Naturalists & Physicians he conversed with, the Repositories and Hospitals he visited, the Libraries he frequented, the Books he selected, *&c.* and taking particular notice of the *Manna* they gather in the Kingdom of *Naples* from the Ash-trees; * of the *Vulva bubalina* dried, having a Musk-sent; of Wine-Vessels

*See Mr *Ray* in his *Catal. Plant. Angliæ*, in *Fraxinus*, p. 118.

made of Cherry-Wood, wherein the conteined Wine and Water have the scent of Cherries; of the Sulpherous Bath at *Puteoli*, and the *Sulfatara*, where the ground you goe upon is Sulphur, which in great quantity is carried away from thence; of the hasty ripening of all sorts of Fruit about *Puteoli*, and their quick corruption; of the effect of Nitrous Waters of the Isle *Ischias* in ripening Flax in three days, and rendring it perfectly White. Being at *Messina*, and conversing there, amongst other learned Men, with the famous *Pet. Castellus*, he got his celebrated Electuary for Hypochondriacal distempers, which he inserts here *pag.* 41, together with its change into a grateful Julep; as also his usual medicine for the *Squinancy* (*p.* 82.) frequent there among Children, and invading their parents by conversation. He takes also notice of the way the *Sicilians* use in making their Sugar; as also of the culture of the Sugar-canes in that Island; and likewise of the Excellent Wine, Saffron and Hony, with which that Country abounds; not passing by the Coral, Amber, Salt, Azur-Stone, to be found there, nor the Mineral Bezoar, and its medical uses.

In the City *Panormus* he observed especially a certain Fountain call'd *Bughuto*, particularly recommended by *Faselus*, yielding a tepid Salt-water, which being drunk presently laxes the belly, and cures many infirmities.

In short, he gives an Example to young Travellers, how in their peregrinations they are to purchase the friendship of Worthy and Learn'd men, to observe Nature and her productions, and to neglect nothing that may be usefull some way or other.

He concludes the whole with prescribing some precepts for the conservation of the Health of Travellers; for which he collects certain heads out of *Bernhardus Gordonius* his *Lilium Medicinæ* and his Book *de Conserv. Vitæ hum*; which prescripts have respect to Sea and Land, Winter and Summer-voyages, and that both in hot and cold Climats. Among many things he observes, that the custom of the Seamen of *Denmark* is, for the prevention of Sea-sickness to drink one draught of Sea-water, as soon as they come on board.

But in no Voyage he would have Men to be so fond of forrain Countries, as to forget to return to their own; putting them in mind of *Hormisdas*, who being asked what he thought of the stateliness of *Rome*, answer'd, he had found men Die there as well as at home.

III. *Georgii Hieronymi Velschii Hecatosteæ* II. *Observationum PHYSICO-MEDICARUM* Augustæ Vindelicorum, 1675.

OF these Two Centuries of Observations we shall here touch some of the chief, *viz.*

1. Of the fruit of *Solanum Vesicarium*, which being of a sweet-acid taste, when gather'd immediately by the mouth, grows presently bitter upon the least touching of them with ones finger.

2. Of the Salt of *Centaurium minus* (the *small Purple-centory*) which our Author saith doth, when kindled, make almost as vehement a noise as Gun-powder: Adding this further Note, that he can prepare out of the Salt of another Vegetable (which he names not) a kind of Gun-powder, which when a bullet is put upon it in the free Air, throws it up to a considerable height, with a great noise, no otherwise than if it came out of a Gun-barrel.

3. Of a Man, whose calling was that of a Porter, who was found, when open'd after his death, to have his skull of the thickness of ones little finger and without any Sutures at all, and yet in his life-time never heard to have complain'd of the head-ache.

4. Of a *White* Magnet, found in the Repository of a Curious person, of the same power with the best of common Magnets. As also of another Loadstone in the same persons possession, that was factitious; of the manner of making of which the Author gives his thoughts at large.

5. Of an odd effect of a Childbearing womans Imagination; whereby she, being surprised and frightned with the sight of an Ape carrying a red hat on his head, brought forth a Childe exactly resembling the head of an Ape so dressed, and for the rest like a human body.

6. Of Tryals made with the *Sympathetick Powder* prepared of Vitriol both burnt and unburnt; Which were these: The Author having by chance wounded his hand, he well wetted a linnen rag with the blood of that wound, (*without* any of the said sympathetick Powder,) and closed it up in a chest, where it was free from the open Air, smoak and dust, tying the wound about with nothing but another meer linnen rag; The next day he caused the said rag that was laid up in the chest, to be exposed to the Noon-heat in one of the Dog-days; without finding any inconvenience from thence: as he did neither upon exposing the same to the Fire; nor upon im-

merſing it into cold water, wine, vinegar; but found the wound healed the ſame day. Whence he infers, that if any wounds be healed *upon* the uſe of the ſaid Powder, the ſame might have been as well cured *without* it, by the meer winding ſome linnen about it, and keeping the Air from it.

6. Of the *Genueſe* Balſom (ſuppos'd to be the ſame with the *Spaniſh* Balſom of *Aquapendente*,) in curing the pain of the exterior parts of the body, and eſpecially thoſe in the Bowels of women that have ſuffer'd violence in travel. Of which, and the like kind of remedies, as alſo of ſeveral medicines, obſerv'd to have been beneficial in the Cure of divers Diſeaſes, as the Colick, Conſumption, Rheumatiſm, Epilepſy, Hæmorrhoids, Diarrhæa, Head-ache, Gout, Palſy, &c. the Reader may conſult the Author; from whom I ſhall borrow but one obſervation more, which is a *Coſmetick* for the face, deſcribed in his ſecond century, Obſ. 31. conſiſting in this, that he beats ℥ij of the Pearl-bearing Oyſter-ſhells into very ſmall duſt, and diſſolve it in Vinegar; then takes of *Benjamin* and Venetian *Borax* ℥j; and having mixed them together, makes a ſolution of them in ℥jv of well rectified Spirit of Wine, powring on it of white Lilly and Plantin-water, of each ℥vj, and letting it ſteam half away upon a very gentle fire.

IV. Joh. Nicolai Pechlinii *M. D. &c. de AERIS & ALIMENTI DEFECTU, & VITA SUB AQUIS Meditatio.* Kiloni, 1676. *In* 8°.

This Author having received out of *Sweden* a very extraordinary relation about a Man drowned under Ice and revived after sixteen hours time, takes thence occasion to discourse in this Tract in general, how far *Air* and *Aliment* are necessary to the life of Vegetables and Animals.

He begins with *Vegetables*, and examines the necessity of Air and water to preserve them alive. Where he observes the obscure degree of life in Bulbs and Roots during winter; as also the cause of the distinction of life in *Annual* and *Perennial* Plants; together with the hasty Growth of some Vegetables.

Proceeding to *Animals*, he inquires *first* into the Life of *Insects*, and their apparent Death in winter, (which he esteems not to be without a remainder of the principle of Life;) as also into the Changes of some of them into Aurelia's and Butterflyes. Here he takes notice, after *Malpighi*, of those exceeding minute tubes in Silk-worms, through which the Air passeth and carrieth on the motion of the liquor in their annular fibers.

Next he explains, how the same alteration of Life and Death holds in *Birds* (particularly in *Swallows* and *Storks*,) that is found in Insects; and takes notice of the Swallows immerging themselves under the water on the sides of the Baltick Sea, and remaining there all winter, and reviving again in the Spring, flying about upon their being taken up in winter, and brought into a Hot stove.

Thirdly, he attempts to shew, why Fishes cannot live long in the open Air; *partly* because the current of the Air is more impetuous than the nature of Fishes will bear; *partly*, because the Motion of the Air carries off that viscous moisture which overlays their outside; *partly* also because the motion of their fins, by which

the

the blood is made to circulate in them, having no place in the free Air, the blood must needs stagnate in that Element: Though some Fishes, especially those that emit, and are covered with, a very viscous moisture, as *Tenches*, *Skates*, *Eels*, (which last, he notes, do as often send forth new slime for their cover, as you wipe of the former,) will live longer in Air than others. Here he notes, that Fish under conglaciated water die not so much for want of Air, as from the plenty of the vapors that issue from the warm bottom. To all which he adds the reason, why Oysters, Lobsters, Shrimps, and the like, survive longer in the Air, than other inhabitants of the water. Concluding this Chapter with an account, why the *Serpentin* Kind grow torpid of themselues in winter, and after revival cast their skins every year.

Fourthly, he discourses of some *Quadrupeds* hiding themselves in caves during winter, as *Bears*, *Hedge hogs*, *&c.* observing, that, what-ever the tradition be of Bears sleeping all winter, and sucking now and then their paws, it will be found, that they sleep soundly at first for a good while, but afterwards awaken and live upon some provision they have stored up for that dead time of winter: And, as to the oleous moisture sweating out of the tubulous Channels of their feet, that that hath no other use, than to soften and smooth, by being licked up, the Sinuosities of the stomach and bowels that had by long abstinence been much corrugated, and so prepare them again for the new food to be taken in by the animal.

Fifthly, he inquires how far tis possible for Men to live without Air. Where he relates *first* an example, upon his own knowledge, of a woman strangled, which was recover'd to life by a good dose of Spirit of Salt *Armoniac*; Adding, that doubtless many such might be recovered, if the like brisk spirits together with bleeding and friction were employed. Then he inquires into the Possibility of the living of Men *under water*: Where he begins with the consideration of the difference there is between the life of *Embryo's* and *Urinators* or *Divers*, representing, that the *former* need no other Air, than what is conveyed into them by the mothers rarified blood, being imbued with an aereal ferment; but that the *latter* (the *Divers*,) I mean such as use no Art, are of that temper and consti-

conſtitution that their blood being colder than that of others, and there ariſing but a ſlender efferveſcence of the blood in the heart, there is no quick circulation, nor a neceſſity of expiring any great plenty of ſharp and offenſive fumes; which kind of blood the Author compares to that of fiſhes, or rather to that of Amphibious animals, as Frogs, Otters, Tortoiſes, Crocodils, *&c.* being of that nature, that the Air being once taken in, and included in the Lungs and the Bladders thereof, the motion of the circulating blood may be entertain'd and continued for a conſiderable time.

On this occaſion he relates that extraordinary Example of a Swediſh gardiner, lately alive, who ſome years ago endeavouring to help another that was fallen into the water under the Ice, fell into it himſelf to the depth of eighteen *Swediſh* Ells; where afterwards he was found ſtanding upright with his feet on the ground, and whence they drew him up after he had remained there for the ſpace of ſixteen hours, wrapping him about cloſe with linnen and woollen cloaths to keep the Air from too ſudden a ruſhing upon him, and then laying him in ſome warm place, and rubbing and rolling him, and at length giving him ſome very ſpirituous liquor to drink; by all which he was at length reſtored to life, and brought to the Queen Mother of *Sweden*, who gave him a yearly penſion, and ſhew'd him as prodigy to divers perſons of quality: The ſame thing being alſo confirmed by the famous Dr *Langelot*, who himſelf received the relation in *Sweden* ſo well atteſted that nothing, *ſaith our Author*, can be required more to aſſert an Hiſtorical truth. To which narrative are here ſubjoyned ſome others, ſo much more prodigious, that we want confidence to inſert them here.

To ſolve theſe ſtrange phænomena, Dr. *Pechlinius* pretends, that there remained in theſe perſons, ſome, though very languid and obſcure, motion of the Blood and Spirits, and that that motion was reduced *ad interiora*, and there confined to a ſmall compaſs, without circulation; as alſo that all the remainder of the ſaid motion is to be adſcribed to the Nitro-aerial effluviums (which abound in thoſe waters of *Sweden*) having a congruity to the pores of the bodies, through which they are tranſmitted. And that it may not be thought impoſſible that the blood ſhould get into the Lungs deſtitute of motion, our Author alledges the life of Urinators, in whom

'tis

tis manifeſt that there is a motion of the heart and blood, and yet the reſpiration ſuppreſſed: Where he deſires it may be conſiderd withall, that the Lungs once inſpired doe more eaſily tranſmit the blood, than thoſe that never had any commerce with the Air; as alſo, that ſince part of the blood in a *fœtus* paſſeth through the Lungs collapſed, without reſpiration; all the blood may more eaſily paſs through the once inflated and expanded multitude of bladders, &c.

Errata in this Numb.

P. 665. *l.* 15. *r.* i o e; *& p.* 670. *l.* 6. *r.* hath not taken. *ibid. l.* 12. *r.* as it ſhews. *ibid. l.* 34. *r.* permanent.

Imprimatur,

Julii 18. 1676.

JONAS MOORE,
Soc. Regiæ Vice-Præſes.

London, Printed for *John Martyn*, Printer to the *Royal Society*, at the *Bell* in St. *Pauls Church-yard*. 1676.

BRITISH MUSEUM
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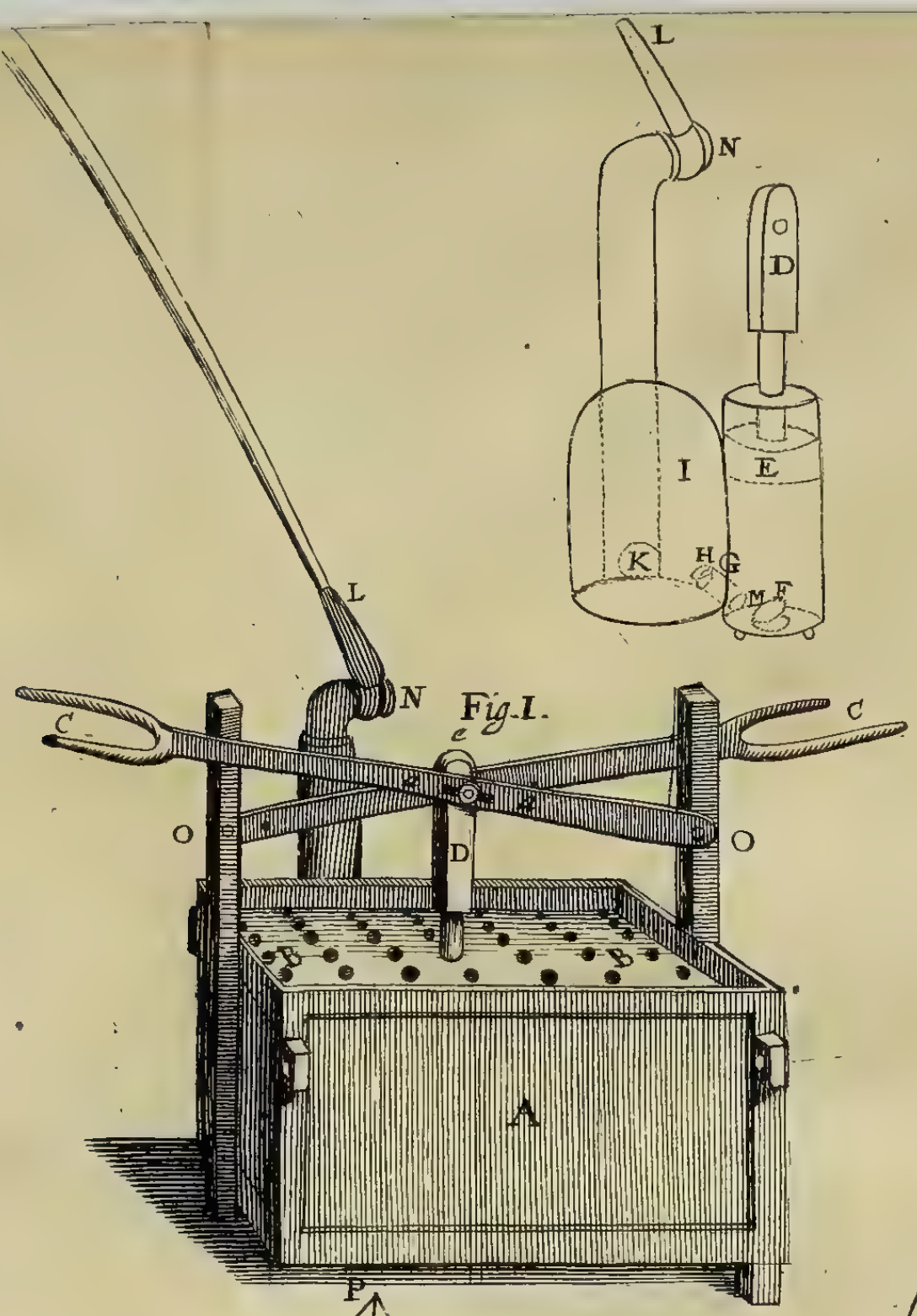

Fig. I.

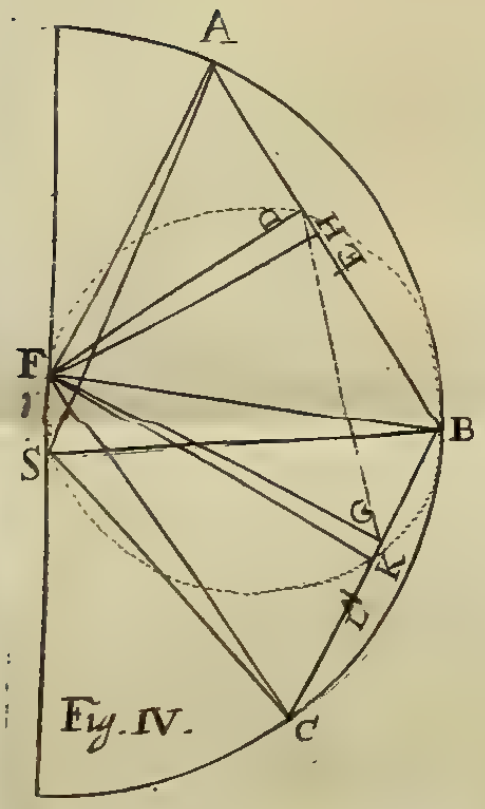

Fig. IV.

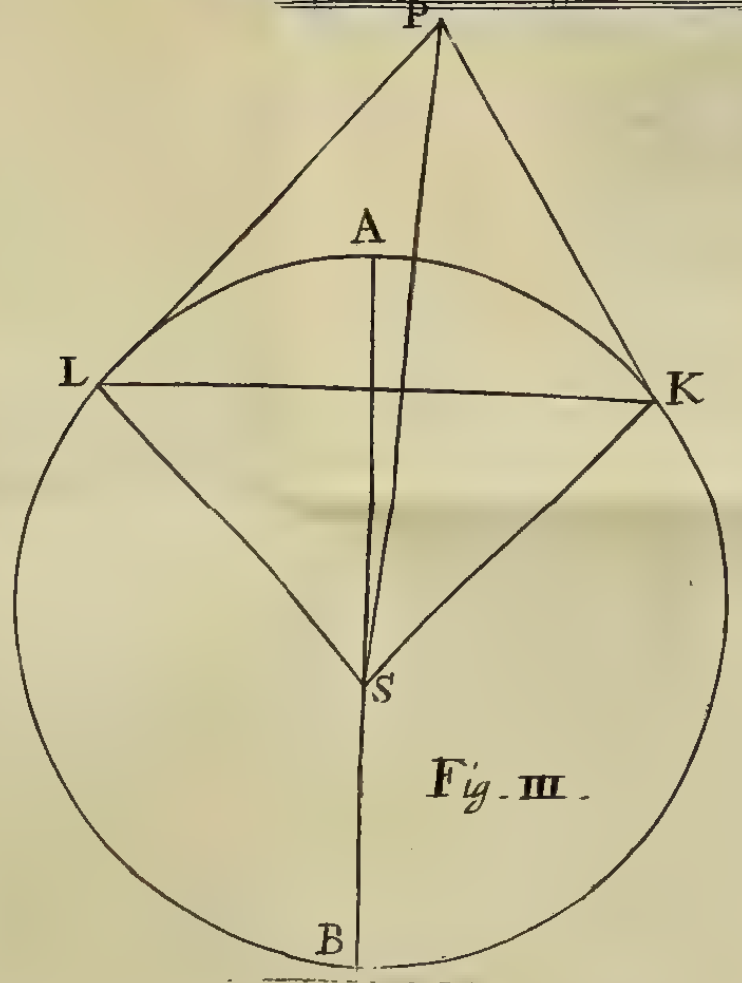

Fig. III.

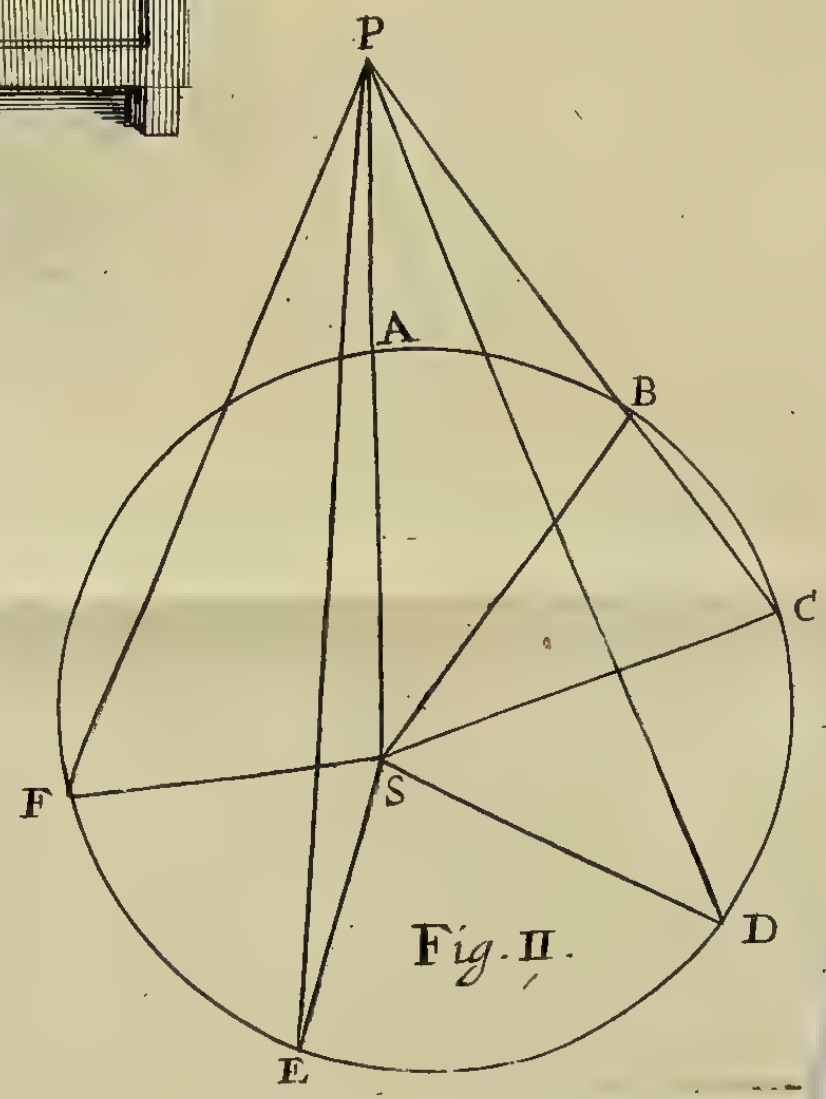

Fig. II.

PHILOSOPHICAL TRANSACTIONS.

Septemb. 25. 1676. for the Months of *August* and *September.*

The CONTENTS.

A Description of an Hydraulique Engin, communicated to the Publisher of the Journal des Scavans, *from the Register of the Royal Academy of the Sciences of* Paris. *Signor* Cassini's *Advertisements to Astronomers about the Configurations by him given of the* Satellites of Jupiter, *for the years* 1676, *and* 1677, *in order to verifie their Theory. A Direct and Geometrical Method for finding the Aphelions, Eccentricities and Proportions of the Orbes of the primary Planets, without supposing the Equality of the Angle of Motion at the other* Focus *of the Planets* Ellipsis; *by Mr.* Edmund Halley *Jun. Several Accounts concerning some Spots newly seen in the Sun. A remarkable Observation of* Saturn. *An Intimation of a sure and easie way to work all sorts of great Telescopic Glasses; together with a generous offer of furnishing industrious Astronomers with them A Letter from* Liege *concerning Mr.* Newton's *Experiment of the coloured* Spectrum; *together with some Exceptions against his Theory of Light and Colors. Mr.* Newton's *Answer to that Letter. An Account of two Books:* I. *Tractatus de VENTRICULO & INTESTINIS, nec non de PARTIBUS CONTINENTIBUS in genere, & in specie de Partibus ABDOMINIS; Auth.* Franc. Glissonio, *M. D. &c.* II. *PHARMACOPEE Royale, GALENIQUE & CHYMIQUE, par* Moyse Charas.

A Description of an Hydraulique Engin, taken out of the Register of the Royal Academy of the Sciences of Paris, *and inserted in the* Journal des Scavans, 1675: *Englished by the Publisher, for the better Examination of those that are skilfull in such Engins here in* England. *See* Tab. 1. Fig. 1.

THE Effect of this Engin is, to throw out water to a great distance, and to what place you will, by the Compression of

the water forced out through a Tube, which turning every way at the end of it, is thereby fitted to direct the Jet of the water to the places where the fire is to be extinguished. That which is most peculiar in this Engin, is, That the Course of the water, issuing out of the Tube that darts it, is continued, not being interrupted, even when the compression of the Pump's Sucker ceases, that is, at the time when you raise it again: For, this affords a great easiness to direct the water well where you would have it.

The Engin is a Chest of Copper, marked A, transportable by means of woodden barrs like a Sedan or Chair. This Chest is pierced with many holes above, BB, and holds within it the Body of a Pump EFM, whose Sucker DE is raised and abased by two Levers C, O; these Levers having each of them two arms, and each arm being fitted to be laid hold on by both hands of a man. Each Lever is pierced in the middle by a Mortaise, *a a*, in which an iron-nail, which passes through the handle of the Sucker, turns round when that Sucker is raised or lower'd. Near the body of the Pump there is a Copper-pot, IHK, joined to it by the Tube G, and having another Tube KNL, which in N may be turned every way.

To make this Engin play, water is powred upon the Chest, to enter in at the holes that are in the Cover thereof. This water is drawn into this body of the Pump at the hole F, at the time when the Sucker is raised; and when the same is let down, the Valve of the same hole F shuts, and forces the water to pass through the hole M into the Tube G, of which the Valve H being lifted up, the water enters into the Pot, and filling the bottom, it enters through the hole K into the Tube KNL, in such a manner, that when the water is higher than the Tube KNL, and the hole of the Tube G is shut by the Valve H, the Air inclosed in the Pot hath no issue, and it comes to pass, that, when you continue to make the water enter into the Pot by the Tube G, which is much thicker than the aperture of the end L, at which it must issue, it must needs be, that the surplus of the water that enters into the Pot, and exceeds that which at the same time issues through the small end of the Jet, compresses the Air to find place in the Pot: which makes, that, whilst the Sucker is raised again to make new water to enter into the body of the Pump, the Air which has been compressed in the Pot, drives the surplus of the water by the force of its spring, mean time that a new compression of the Sucker makes new water to enter, and causes also a new compression of Air.

And

onis est summa duarum partium, quarum in priori analogia fuit differentia : Hujus Theorematis demonstrationem neminem Analytices modicè peritum latere posse arbitror, & idcirco ei supersedeo :) Jam in Triangulo KSL dantur latera KS, LS, & angulus KSL, quæruntur Latus KL, & anguli SKL, SLK : Deinde in Triangulo KLP, dantur KL, KLP, differentia observatarum Longitudinum planetæ, & PKL differentia angulorum SKL ultimò inventi, & SKP Elongationis Planetæ à Sole in prima observatione, quæritur LP : Tum in Triangulo LSP, latera LS, LP, & angulus PLS elongatio Planetæ à Sole in secunda observatione, dantur; latus SP & angulus LSP requiruntur, quibus inventis, ut SP ad LP, ita Tangens Latitudinis observatæ ex L, ad Tangentem Inclinationis sive Latitudinis ad Solem; & ut Co-sinus Inclinationis ad Radium, ita SP curtata distantia, ad veram distantiam planetæ à Sole : Sic tandem invenimus positionem & longitudinem desideratam. Jam restat ut ostendam, quomodo ex datis tribus distantiis à Sole cum angulis interceptis, invenienda sit media distantia cum Eccentricitate Ellipseos.

Sit S Sol, & SA, SB, SC tres distantiæ in debita positione, ductisque AB, BC, sit AB distantia focorum Hyperbolæ, & SA-SB=EH transversa diameter ; quibus positis, describatur linea ista Hyperbolica, cujus focus interior est punctum A, extremitas lineæ longioris SA : Pari modo sint B, C, foci alterius Hyperbolæ, cujus diameter SB-SC=KL ; ex quibus describatur linea Hyperbolica focum habens interiorem in puncto B : Dico has duas Hyperbolas sic descriptas sese intersecare in puncto F, qui est alter Ellipseos quæsitæ focus, ductâque lineâ FA, FB, vel FC, SA+FA, SB+FB vel SC+FC æquabitur transversæ diametro, & SF est distantia focorum : quibus positis descriptio Ellipseos facillima est. Cùm verò hujus constructionis ratio non omnibus ita facile percipiatur, non abs re erit, illustrationem ejus aliquam afferre ; Ideò dico, quòd ex notissima Ellipseos proprietate SB+FB=SA+FA, & transpositis æquationis partibus FB-FA=SA-SB, ita ut etiamsi FB & FA nos lateant, earum tamen differentia æqualis sit SA-SB, hoc est, EH, cúmque sit ex natura Hyperbolæ, ut habeat quasvis duas lineas à suis focis ad quodvis punctum in sua curva constanter differentes quantitate transversæ diametri; constat, punctum F esse alicubi in curva Hyperbolæ, cujus diameter transversa æquatur SA-SB, & Foci A, B : Pari modo demonstrari potest punctum F esse in Hyperbola cujus diameter est SB-SC, & foci B, C. Ergo necesse est, ut sit in intersectione duarum istarum Hyperbolarum, quæ, cùm sese intersecent in unico solum puncto, clarè ostendunt ubi sit Focus alter Ellipseos quæsitæ. Tab. I. Fig. 4.

Jam ut id ipsum Analyticè expediatur, puta factum, sitque FB=a, SA-SB=FB-FA=b, AB=c, SB-SC=FC-FB=d, BC=f, sitque Sinus anguli ABC=S, Co-sinus ejusdem=s. Tum

with *Jupiter*, have alſo the Meridional Latitude in reſpect of his center, as *Jupiter* hath, ſince the month of *March*, in reſpect of the Ecliptique.

The contrariety of latitude between one Satellit, being in the ſuperior part of his circle, and another being in the inferior part of his, is more ſenſible in the encounter of a Direct, which is always ſuperior, with a Retrograde, which is always inferior, and particularly near to *Jupiter*.

Signor *Caſſini* foreſees, 1. That, at the end of *March* next, the Satellites will no more have any latitude in reſpect of *Jupiter*'s center, and that they will appear in a ſtreight line in all their configurations between themſelves and with *Jupiter*, and will eclipſe one another: which, according to *Galilæo*, ſhould have come to paſs ever ſince the firſt months of this preſent year, when *Jupiter* paſſed from the North-ſide to that of the South, and not the next year, when *Jupiter* will have a great Southern latitude. 2. That the ſtreight line of the Satellites will be inclined to the Ecliptique, contrary to the *Galilæan* Hypotheſis. 3. That this diſpoſition of the Satellites in a ſtreight line in their encounter will laſt but a few days, though *Galilæo* aſſure us that it laſts many months. 4. That the next Summer the ſcituation of the circles of the Satellites will be found inverted, in reſpect of that which they have now; for, the ſuperior Semi-circles, which at preſent are turned to the South, will then be turned to the North: which will overthrow the Hypotheſes of *Marius* and *Hodierna*, who ſuppoſe them always turn'd the ſame way.

Theſe Obſervations will ſerve to verifie the Nodes of the Orbes of the Satellites with the Orb of *Jupiter*, and the Obliquity of the one to the others; which are the two Keys to the Theory of the Satellites. Signor *Caſſini* ſettles theſe Nodes towards the thirteenth degree of *Leo* and *Aquarius*; but *Galilæo* ſuppoſed them always to be with the Nodes of *Jupiter*, which are towards the beginning of *Cancer* and *Capricorn*. He finds the Obliquity of their circles to the orbite of *Jupiter* almoſt double to the obliquity of this orbite to the Ecliptique; whereas *Galilæo* ſuppoſes it equal.

Laſtly, he (*Caſſini*) retracts the motion, which he introduced to the Nodes of the Satellites (ſuch as is deſcribed at the end of his firſt Tables) only to reconcile the Obſervations of *Galilæi* with his, and he acknowledges, that the obliquity of their circles is permanent.

The goodneſs of Signor *Caſſini*'s Syſtem, and the imperfection of the Hypotheſes of *Galilæi* are demonſtrated by the Eclipſes of the Satellites

Satellites that come to pass conformable to the calculus of *Cassini*, and differ days and hours from the calculus and predictions made upon the hypotheses of *Galilæi* : Besides that there should happen a great many which do not happen according to the system of *Cassini*. *E. g.* according to the hypothesis of *Galilæi*, the fourth of the Satellites should have more than 90 Eclipses in a year, of the duration of three or four hours ; but according to the system of *Cassini*, the same Satellit will be three or four years without suffering any Eclipse. Which proceeds from nothing but the false situation of the Orbs supposed by *Galilæi* ; as the great difference of the time of the Eclipses that happen depends from this, that neither *Galilæo* nor the other Astronomers do separate from the proper motion of the Satellites the appearances which do befal it by that of *Jupiter* about the Sun. And therefore 'tis, that they have taken for a simple and equal motion a motion compounded of an equal and unequal ; whence they have slipped into an error about the Mean motions, which in progress of time hath so increased, that the Configurations drawn from their hypotheses for that time have almost no likeness at all with those that are observed.

These old hypotheses were therefore far off from serving to find the Longitudes, as their Authors intended them ; since it was impossible for them nor only to observe the Eclipses of the Satellites for some years to the nearness of an hour, but even to make us know and distinguish at this time one Satellit from another, whereas by the System of Signor *Cassini* one may predict for many years to come the Eclipses of the Satellites with as much precisness, as those of the Sun and Moon by the Astronomical Tables.

Methodus directa & Geometrica, cujus ope investigantur Aphelia, Eccentricitates, Proportionesque orbium Planetarum primariorum, absque supposita æqualitate anguli motûs, ad alterum Ellipseos focum, ab Astronomis hactenus usurpatâ. Auth. *Edmundo Hally* Jun. è Collegio Reginæ *Oxon.*

MOtus Terræ annuus per Eclipticam, opticam inæqualitatem induxit motibus cæterorum planetarum, Astronomis Copernicanis *nomine Parallaxeos orbis notissimam; quam quidem inæqualitatem, ex observationibus non multâ operâ datam, methodi sequentis basin firmissimam constituo ; ubi præter observata nihil aliud supponitur, quàm quòd orbes Planetarum sint Ellipses, quódque Sol in foco, omnium orbibus communi, sit constitutus, & denique, quòd tempora periodica singulorum*

singulorum ita innotescant, ut non sentiatur error aliquis, saltem in duabus vel tribus revolutionibus: His concessis, motus Terræ, pro cæteris Planetis necessariò requisitus, primò aggrediendus est.

Tab.I. Fig.2. *Sit* S *Sol*; ABCDE, *orbis Terræ*; P, *Planeta* ♂*Mars*, (*qui in hanc rem plurimis de causis longè præferendus est*;) *& primò observetur verum tempus & locus, quo* ♂*Mars opponitur Soli; tunc enim Sol & Terra coincidunt in lineam rectam cum Marte; vel*, (*quod fere semper accidit*) *si habuerit latitudinem, cum puncto, ubi perpendicularis à Marte demissa in planum Ecliptica incidit. Sic in* Schemate, S, A, *&* P *sunt in linea recta; deinde post* 687 *dies, Mars revertitur ad idem punctum* P, *ubi in priori observatione Soli opponebatur; Terra verò, cùm non revertatur ad* A, *nisi post* 730½ *dies, in* B, *Solem respicit in linea* SB, *Martem verò in linea* BP, *& observatis longitudinibus Solis & Martis, omnes anguli Trianguli* PBS *dantur, & suppositâ* PS 100000, *in iisdem partibus invenitur longitudo lineæ* SB; *pari ratione post alteram Martis periodum, Terra existente in* C *invenitur linea* SC, *nec absimiliter lineæ* SD, SE, SF; *differentiæque observatorum locorum Solis, sunt anguli ad Solem* ASB, BSC, CSD, DSE: *Sic tandem ventum est ad hoc problema Geometricum*: Datis tribus lineis, in uno Ellipseos foco coeuntibus, tam longitudine quàm positione, invenire longitudinem transversæ diametri, cum distantiâ focorum: *Cujus resolutio extenditur etiam ad reliquos planetas, si, post Theoriam motûs Terræ cognitam, scrutemur* (*secundum methodum propositam à Reverendiss. Episcopo* Sarisburiensi *in* Astronomia *ejus* Geometricâ lib. 2. part. 2. cap. 5.) *tres distantius planetæ alicujus à Sole in positionibus suis. Quoniam verò Rev. Episcopus supponit planetam ita ferri in orbe suo, ut æqualibus temporibus æquales angulos ad focum alterum Ellipseos absolvat, & ei calculum suum superstruit, non incongruum videtur, ostendere, quomodo id ipsum fieri possit absque ista suppositione, quam observatio nos rejiciendam monet.*

Tab.I. Fig.3. *Sit* S, *Sol*; ALBK, *orbis Terræ*; P, *Planeta, vel Punctum in plano Ecliptica, ubi perpendicularis, à planeta demissa, incidit*; AB *linea Apsidum orbis Terræ: Observentur primò Planetæ, in* P, *longitudo & latitudo, simulque Solis* Longitudo *à Terra in* K; *& post periodum ejusdem planetæ, Terra existente in* L, *observentur denuo positiones Planetæ Solisque, ut prius: Jam ex observatis longitudinibus Solis & Aphelii Terræ, anguli* ASK, ASL *dantur, & consequenter latera* SK, SL: (*Nam si angulus Anomaliæ coæquatæ sit* acutus, *proportio est, ut differentia distantiæ mediæ & Co-sinus anguli in Eccentricitatem ducti, ad distantiam Apheliam, ita Perihelia distantia, ad distantiam Planetæ à Sole in datâ Anomaliâ: quòd si angulus fuerit* obtusus, *primus terminus proportionis*

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Tab. II.

PhTr N°. 128.

Fig. III.
14 Augusti

Fig. II.
Macula in ⊙
8 Aug

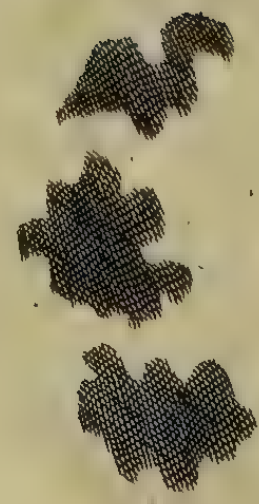


Fig. I.

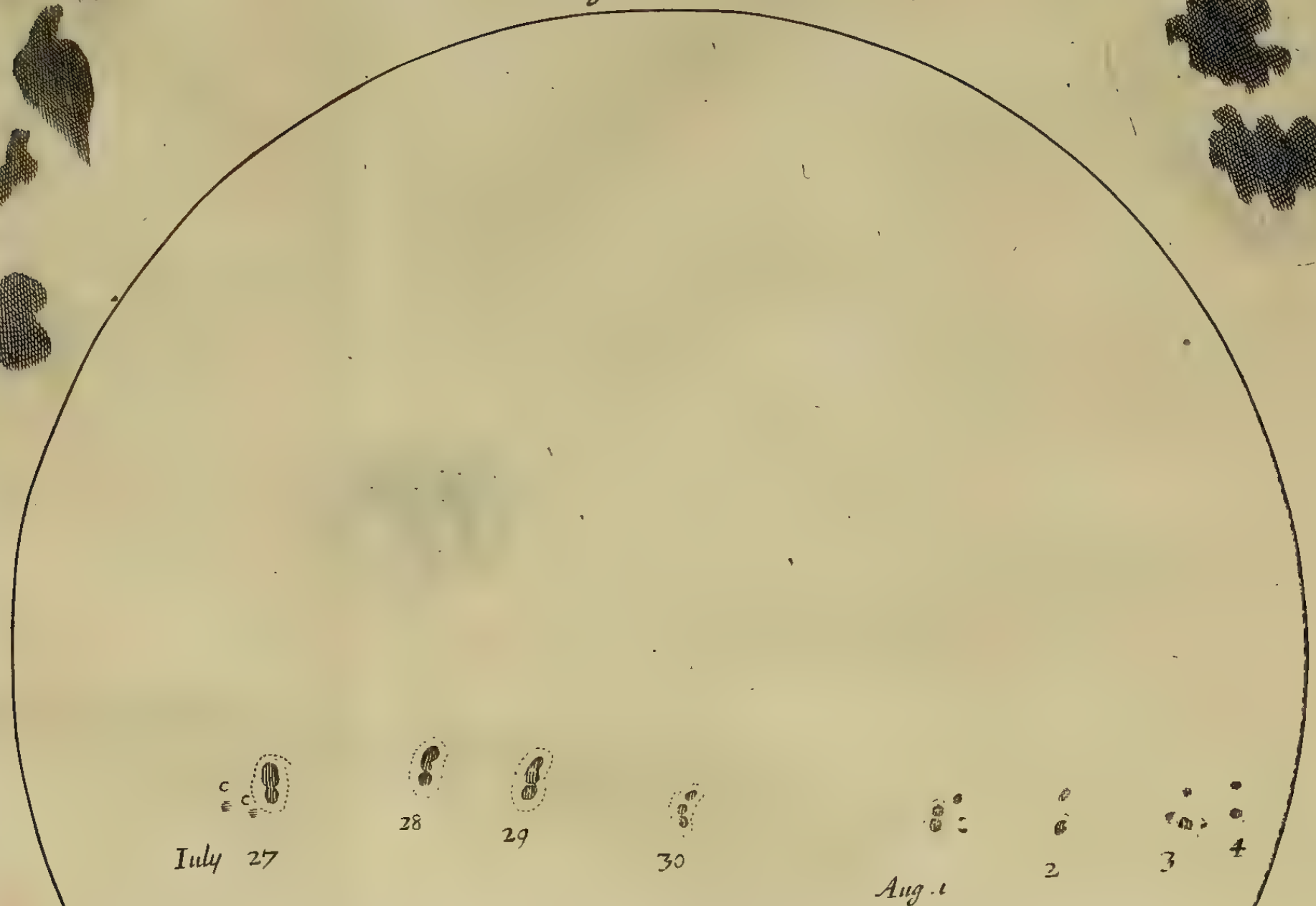


Fig. IV.

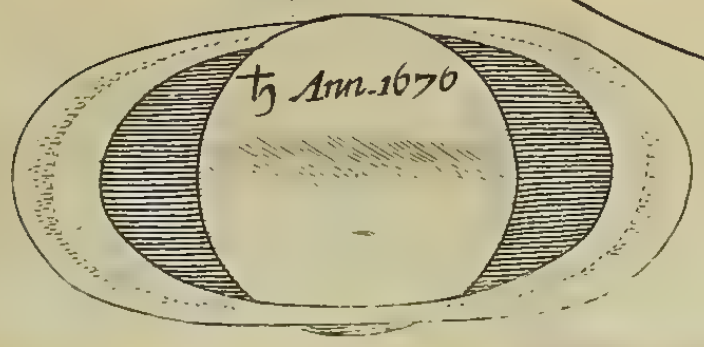
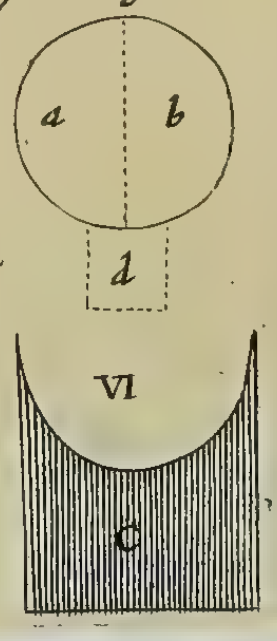


Fig. V.



An Extract of an account given by Mr. Flamstead *of his own and Mr.* Edmund Halleys *Observations concerning the Spots in the Sun, appearing in* July *and* August 1676.

THe following *Ephemeris* was deduced from careful observations (made with the Micrometer) of the Distances of the Spots from the Limb of the Sun, and the differences of Altitudes and Azimuths from the upper and under parts and sides of him. The comparing of the Observations made in two distant places, *Greenwich* and *Oxford*, do evince the diligence of the Observers and the goodness of their Instruments; the differences between them being easily excusable; for that the Spot had a diameter more considerable than any of the differences, and was broken into several pieces. See *Tab.* II. *Fig.* 1.

1676. Julii *st. v.*	Grenovici *Tempus observationum.*	*Longit. from the* ⊙ *center.*	*Latitud. South.*	1676.	Oxonii	*Long.*	*Lat.*
	h.	′ ″	′ ″		h. ′	′ ″	′ ″
27	10.03. A.M.Con.	9.34	3.25	Jul.25	6.46.P.M.Con.	13.40	2.08
28	4.51	5.40	2.50	26. 27	28 *dies nubili.*		*Austr.*
29	10.31. A.M.	3.05	3.27	29	6.21. A.M.	3.55	3.22
	3.54. P.M.	2.25	3.10				
30	9.15. A.M.Ant.	0.37	3.33	30	7.20.A.M.	0.00	3.3½
31	. . . . .	.	.	31	7.40.A.M.	3.36	3.28
1.Aug.	9.24⅚ A.M.	6.48	4.09	1.Aug.	7.03.A.M.	6.54	3.50
	. . . . .	.	.		5.06. P.M.	8.07	3.53
2	8.08. A.M.	9.49	3.55	2	7.16. A.M.	9.57	3.40
3	9.36. A. M.	12.28	3.27	3	5.09. P.M.	13.15	3.56
	4.16⅔ P.M.	12.55	3.58		6.02. P.M.	13.25	3.26
4	7.38. A. M.	14.02	4.04	4	7.33. A.M.	14.07	3.14
					4.54. P.M.	14.43	3.23

Mr. *Hally* saith, that he saw the Spot again on the fifth day at 8$^{h.}$ 30′ *mane*, very near the limb of the Sun, so that it appeared only as a fine line; but by reason of its fineness and the too great height of the Sun he could not take any measures to determine its place and latitude by; and that, while the Spot

continued one, as it was *July* 25, he measured to the middle of it; as also when the pieces were divided, but not far disjoyned: Afterwards, when they were separated considerably, he observed the middle of the bigger Spot, which was to the South, apparently, I suppose; but really, North: for so only his Observations will agree with those of Mr. *Flamstead* exactly.

Hence it seems very evident (saith Mr. *Flamstead*,) that the Spots way was not inclined to the Ecliptick six or seven degrees, as *Scheiner* and some others make it, but much less, by the joynt consent of the observations of both our Observers. Mr. *Hally* adds, that considering the motion of the 'Spot cross the Suns disque, *as both their Observations give it*, 'it appears, that the Latitude was not so great at its Entrance 'into the Sun as in the Middle of him. And by Mr. *Flamsteads* 'Observation it was greatest on the first of *August*, and then 'again inclining towards the Ecliptick. If you grant this, it 'will follow, (infers Mr. *Flamstead*) that the Suns *Axis* was in-'clined to the plain of the *Orbis Magnus*; but the quantity 'of this Inclination must not be very great. The *Nodes* of 'the Suns Equinox and Ecliptick he guesses to be not far from 'the beginning of *Cancer* and *Capricorn*; and that from *Cancer* 'to *Capricorn* the Earth is North of the Suns Equator; from '*Capricorn* to *Cancer*, South of the same: And the period of 'the Suns revolution in respect of the fixed Stars 25 daies, '9½ hours sufficiently exact. Of which things, these two Observers say, they might have been more certain, had not the Spot in its passage broken into so many parts, and those often varied their positions to each other. These Conjectures though probable, yet when another of the like *phænomena* appears, will still deserve the further consideration of the Curious.

An

An Extract of Signor Cassini's *Letter concerning a Spot lately seen in the Sun; together with a remarkable Observation of* Saturn, *made by the same.*

Clarissimo Viro

Domino *Henrico Oldenburg* Regiæ Societati à Secretis
Joh. Dominicus Cassinus, S.

GRatissima mihi fuit observatio Solaris maculæ, quam à Domino Flamstedio exhibitam mihi communicare dignatus es! Eandem hîc observavimus à die 6 Augusti ad 14 S.N; collationéque observationum didicimus, eam medium itineris sui in Solis disco apparente tenuisse circa mediam noctem post octavam diem Augusti in distantia apparenti trium minutorum à centro Austrum versùs. In plures distracta partes est, quæ invicem Boream & Austrum versùs in dies satis manifesto intervallo disjungebantur, adeò ut, præter motum communem circa Solis axem, singulæ partes proprium inter se directum habuerint. Hanc porrò maculam diversam esse sentio ab ea, quàm præcedenti mense Junio observaveramus. Illa quippe cùm medium itineris sui in disco Solis apparente tenuerit die 28 ejusdem Mensis, ad eundem proximè situm reversa esset (si fuisset superstes) die 25 Julii nocte sequente, ut deducitur tum ex ejus velocitate, tempore suæ apparitionis observatâ, tum etiam ex cursu aliarum macularum, quæ periodum suam circa Solem à nobis videntur absolvere spatio dierum 27 cum triente, vel 27 cum semisse. Ejus præterea semita diversa est à præcedenti; prior quippe paulo remotior fuit ab Æquatore macularum, quàm posterior. Hæc porrò, si satis habuerit consistentiæ, ad medium Solem redibit die 5 Septembris mane. Ex ejus descriptis phasibus duas selegi, quarum comparatione ipsius innotescit distractio. Vid. Tab. II. Fig. 2 & 3.

Scribo apud D. d'Alencé, *qui mihi* Acta tua Philosophica *mensis* Julii *communicavit. Observationes Solaris Eclipsis ibi contentas conferam expendamque: Ex schemate* Saturni *à Clarissimo* Hevelio *ante annum observato video, eum Telescopiis, nostris longè inferioribus, uti. Tunc enim temporis (ut & nunc) cernebatur nobis in* Saturni *globo Zona subobscura, paulo Australior centro, instar Zonarum Jovialium. Deinde latitudo annuli dividebatur bifariam, lineâ obscurâ apparenter Ellipticâ, re verâ circulari, quasi in duos annulos concentricos, quorum interior exteriori lucidior erat. Hanc phasim statim post Emersionem* Saturni *è Solaribus radiis per totum annum usque ad ejus Immersionem conspexi; primò quidem, Telescopio pedum* 35; *deinde minori, pedum* 20. *Ejus delineationem, utcunque rudem, properante calamo hic adjeci.* Vid. Tab. II. Fig. 4.

Vale, Vir Clarissime, & me, ut soles, ama.
Parisiis die 26 *Augusti* 1676.

An

An Intimation given in the Journal des Scavans, *of a ſure and eaſie way to make all ſorts of great Teleſcopical Glaſſes, together with a generous offer of furniſhing induſtrious Aſtronomers with them.*

THe Uſefulneſs of great Glaſſes for Teleſcopes, and the care and pains hitherto taken to perfect this Invention is ſufficiently known; but the difficulty of the work doth ſo much increaſe in great Glaſſes of that kind, that it hath not been ſurmounted hitherto.

Monſieur *Borelli*, one of the Royal Academy of the Sciences of *Paris*, whoſe addiction to Natural Philoſophy, and chiefly to Chymiſtry, hath been known long ſince, hath found out a ſure and very eaſie method to work all ſorts of ſuch great Glaſſes, which hath never failed him. He hath already carried the Experience of his Secret to extraordinary bigneſſes, having made one of them very good of two hundred foot, wrought on both ſides on the ſame rule: Which ſhews, that if he had wrought it flat on both ſides, the glaſs would have been of four hundred foot.

This eaſineſs of making great Glaſſes, and the deſire of procuring ſome advancement to Aſtronomical diſcoveries, have induced him to make preſents of them in divers places to ſeveral perſons capable to make uſe of them: And the ſame motive doth now invite him to make the like offer not only to the Aſtronomers that are diſperſed up and down in the Kingdom of *France*, but alſo to thoſe that are in forreign Countries, eſpecially in thoſe parts, where there is ſome eſtabliſhed Academy or Society for Aſtronomical Obſervations; offering in this caſe to every one of ſuch Societies three very good Glaſſes, one of ten or twelve foot for a Chamber; another of twenty five or thirty foot for ordinary obſervations, and a third of ſixty or eighty foot, to make new diſcoveries with.

Private perſons that are not in a condition to make Engins for great Glaſſes, may, at leaſt, make uſe of Glaſſes of fourteen or twenty foot, which he is willing to ſend them, therewith regularly to obſerve the Eclipſes of the *Satellites* of *Jupiter* which happen almoſt every day, and afford ſo fair a way for eſtabliſhing

eſtabliſhing the *Longitudes* over all the Earth. For, beſides that theſe Eclipſes are very frequent, the Emerſion and Immerſion of theſe *Satellites*, eſpecially in the ſhadow of *Jupiter*, is ſo momentany and ſo ſenſible, that they may be obſerved with the greateſt exactneſs, being altogether exempt from thoſe eſſential inconveniencies that accompany the Eclipſes of the Sun and Moon, which alſo are rare, and whoſe beginning and end are alwaies doubtful by reaſon of a certain ambiguous light.

The Longitudes of places at Sea, Capes, Promontories, and divers Iſlands being once exactly known by this means, would doubtleſs be of great help and conſiderable uſefulneſs to Navigation.

Since Monſieur *Borelli* hath found this way of working Glaſſes, he entruſted the ſecret of it to a perſon of the Academy above-mentioned; and he purpoſeth to publiſh the ſame hereafter, with ſome other conſiderable Obſervations touching the ſame Glaſſes.

A Letter from Liege *concerning Mr.* Newton's *Experiment of the coloured* Spectrum; *together with ſome Exceptions againſt his Theory of* Light *and* Colours.

Hon^rd Sir,

MR *Gaſcoigne* having received your obliging Letter of *Jan.* 18, with freſh directions from Mr. *Newton*; but wanting convenience to make the Experiment according to the ſaid inſtructions, he has requeſted me to ſupply his want. In compliance with his requeſt I have made many Trials; the iſſue whereof I here acquaint you with: next, with ſome exceptions, grounded on Experiments, againſt Mr. *Newton*'s new Theory of *Light* and *Colours*.

The vertical angle of my Priſm was 60 *deg*; the diſtance of the Wall, whereon the coloured *Spectrum* appeared, from the Window, about 18 foot: The diameter of the Hole in the Window-ſhuts in length the line *a*, which upon occaſions I contracted to half the ſaid diameter; but ſtill with equal ſucceſs as to the main of the Experiment. The refractions on both ſides the Priſm, were as near as I could make them, equal,

a

equal, and consequently about 48 *deg.* 40′, the refractive power of Glass being computed according to the *Ratio* of the *Sines* 2 to 3. The distance of the Prism from the hole in the Shuts was about 2 inches: The Room darkned to that degree as to equal the darkest night, while the hole in the Shuts was covered.

Now as to the issue of my Trials; I constantly found the length of the coloured image (transverse to the axis of the Prism) considerably greater than its breadth, as often as the Experiment was made on a clear day; but if a bright Cloud were near the Sun, I found it sometimes exactly as Mr. *Line* wrote you, namely broader than long, especially while the Prism was placed at a great distance from the hole. Which Experiment will not, I conceive, be questioned by Mr. *Newton*, it being so agreeable to the received laws of Refractions. And indeed the Observations of these two Learned persons, as to this particular, are easily reconcileable to each other, and both to truth; Mr. *Newton* (as appears by his Letter of *Nov.* last, wherein more fully he delivers his mind) contending only for the length of the Image (transverse to the axis of the Prism) in a very clear day; whereas Mr. *Line* only maintain'd the excess of breadth, parallel to the same axis, while the Sun is in a bright cloud. Though as to what is further delivered by Mr. *Newton* (*Phil. Transact. N.* 80. *p.* 3077; and opposed by Mr. *Line*, *N.* 129. *p.* 501.) namely that the length of the coloured Image was five times the diameter of its breadth; I never yet have found the excess above thrice the diameter, or at most $3\frac{1}{4}$, while the refractions on both sides the Prism were equal. So much as to the matter of fact.

Now as to Mr. *Newton*'s Theory of *Light* and *Colours*, I confess, his neat Sett of very ingenious and natural inferences, was to me upon the first perusal a strong conjecture in favour of his new doctrine; I having formerly observ'd the like chain of Inferences upon search into Natural truths. But since several experiments of Refractions remain still untouch'd by him, I conceived, a further search into them would be very proper in order to a further discovery of the truth of his Assertion. For, accordingly as they are found either agreeing with, or disagreeing from, his new Theory, they must needs much strengthen

then, or wholly overthrow the same. The Experiments I pitched upon for this purpose, are as follow:

1. Having frequently observed, that the form of Objects viewed in the Microscope (or rather of the Microscope it self) consists almost in an indivisible point, I concluded, two very small pieces of Silk, the one scarlet, the other violet colour, placed near together, should, according to Mr. *Newton*'s Theory, appear in the Microscope in a very different degree of clarity, in regard their unequal refrangibility must cause the scarlet rays or species to over-reach the *Retina*, while placed in the due focus of the violet ones, and consequently must occasion a sensible confusion in the vision of the former, one and the same point of the Scarlet object affecting several nerves in the *Retina*. Yet upon frequent trials I have not been able to perceive any inequality in this point.

2. The second Experiment I made in Water. I took a brass Ruler, and fastening thereunto several pieces of Silk, red, yellow, green, blew and violet, I placed it at the bottom of a square vessel of Water: then I retired from the Vessel so far as not to be able to see the aforesaid Ruler and coloured Silks otherwise than by help of the refracted Ray. Now, did Mr. *Newton*'s doctrine hold, I conceiv'd, I should not see all the mentioned Colours in a streight line with the Ruler, in regard the unequal refrangibility of different Rays must needs displace some more than others. Yet in effect, upon many Trials, I constantly found them in as streight a line as the bare Ruler had appeared in.

3. To advance this Experiment, I adjoyned a second refraction to the former of the Water, by placing my Prism so as to receive *perpendicularly* the refracted *species* of the Silk and Ruler; whereby only the emergent *species* suffered a second refraction. But still with equal success, as to their appearing in a straight line, to the eye placed behind the Prism.

4. To these two Refractions I further added a third, by receiving the coloured species *obliquely* upon the Prism; whereby both incident and emergent *species* suffered their respective refractions. But still with the same success as formerly, as to the streight line they appeared in.

For

For further assurance in this Experiment, lest prepossession, occasioned from previous knowledge of the Silks scituation in a streight line, might possibly prejudice the judgment of the eye (as sometimes I have observed to happen to the judgment the Eye passeth upon the distance of Objects) I called into the room some unconcerned persons, wholly ignorant what the Experiment aimed at; and demanding whether they saw not the coloured Silks and Ruler in a crooked line? they answered in the negative.

5. The next Experiment I made in uncompounded Colours (as Mr. *Newton* terms them, *Prop* 5 & 13.) as follows. Having cast two coloured Images upon the Wall, so as the Scarlet colour of the one did fall in a streight line (parallel to the Horizon) with the Violet of the other: I then looked upon both through another Prism, and found them still appear in a streight line parallel to the Horizon, as they had formerly done to the naked eye. Now according to Mr. *Newton*'s Assertion of different refrangibility in different Rays, I conceive the Violet rays should suffer a greater refraction in the Prism at the eye, than the Scarlet ones, and consequently both colours should not appear in a streight line parallel to the Horizon.

6. Another Experiment I made in order to some further discovery of that surprizing *Phænomenon* of the coloured Image, which occasioned Mr. *Newtons* ingenious Theory of *Light* and *Colours*, as also his excellent invention of the reflecting *Telescope* and *Microscope*. Having then sometimes suspected, that not only the direct Sun-beams, but also other extraneous light might possibly influence the coloured *Spectrum*, I hoped to discover the truth of this suspicion by means of the Sun-spots, made to appear in the coloured Image by placing a Telescope behind the Prism. But my endeavours proving ineffectual herein by reason of some intervening difficulties, I thought at length of a more feasible method in order to the designed discovery, as in the following Experiment.

I fastened a very white Paper-circle (about an inch in diameter) upon my Window-shuts; and beholding it through my Prism, I found a Coloured image painted thereby upon my *Retina*, answerable in almost all respects to the former of the

Sun-beams upon the Wall, especially when the Paper-circle was indifferently well illuminated. This Image indeed appeared contrary to the former as to the scituation of Colours, that is, the Scarlet appearing above, the Violet below, though but faint. But this I was not surprized at, having observ'd upon dissecting the eye, that objects are painted on the *Retina* after a contrary posture to what they appear to Sight. Having thus rendred the Coloured image much more tractable than formerly it was, I conceived good hopes of some further discovery in the point mentioned.

In pursuance then of my former suspicion, having fixed my Prism in a steady posture, I caused the paper *C* to be applied close up to the Paper-circle *a b d*: whereupon the former Violet *d*, and Scarlet colour of *C* vanished into whiteness. Next, I removed the mentioned Circle from the Shuts, and placed it in the open window, supported only by the edge *d*: whereupon, to my astonishment, all the former Colours exchanged postures in the *Retina*, the Scarlet now appearing below, the Violet above; the intermediate Colours scarce discernible. And here, on the by, 'tis very remarkable, that, during this Observation, I clearly perceived both Blew- and Scarlet-light to be transparent, I being able to discern several objects through both, namely Steeples opposit to my window. Whence it follows, that these Colours do in great part arise from the neighbouring light. Lastly, I placed the Paper-circle anew, so as the one half *b* was fastened to the Shuts, the other semicircle *a* being exposed to the open Air. Whereupon the semicircle *a* became bordered with Violet above, Scarlet below; but the other semicircle *b* quite contrary. Hence I make the following Inferences.

V. Tab. II. Fig. 5 & 6.

First, That not only the Light reflected from the Paper-circle, but also from the ambient Air, hath great influence upon the Colcured image, especially as to the Violet and Scarlet colours. Whence perchance it will not hereafter seem strange, that the coloured *Spectrum* on the Wall is so long, but only that the breadth is not greater. *Secondly*, Were there a more luminous body behind the Sun, we should in all likelyhood have the colours of the *Spectrum* in a contrary scituation to what they appear in at present: Whence (*thirdly*) it seems to follow, that

the preſent ſcituation and order of Colours, ariſeth not from any intrinſecal property of refrangibility (as maintained by Mr. *Newton*) but from contingent and extrinſecal circumſtances of neighbouring objects. For accordingly as the body behind the Paper-circle was more or leſs illuminated than the Circle it ſelf, all the ſeveral Colours changed their ſcituation.

8. The next Experiment was made in order to Mr. *Newtons* doctrine of primary Colours, as *Prop.* 5. Having covered the Hole in the Window-ſhuts with a thin ſlice of *Ivory*, the tranſmitted light appeared yellow; but upon adding three, four, and more ſlices, it became red. Whence it ſeems to follow, that Yellowneſs of light is not a primary colour, but a compound of Red, &c.

9. The laſt Experiment was made in reference to Mr. *Newton*'s 12 *Prop.* where from his own principles he renders a very plauſible Reaſon of a ſurprizing *Phænomenon*, related by Mr. *Hooke*; namely of two liquors, the one Blew, the other Red, both ſeverally tranſparent, yet both, if placed together, became opake. The reaſon whereof, ſaith Mr. *Newton*, is, becauſe if one liquor tranſmitted only Red, the other only Blew, no rays could paſs through both.

In reference then to this point, I filled two ſmall Glaſſes with flat poliſhed bottoms, the one with *Aqua fortis*, deeply died Blew; the other with Oyl of *Turpentine*, died Red; both to that degree, as to repreſent all objects through them reſpectively Blew or Red. Then placing the one upon the other, I was able to diſcern ſeveral bodies through both: whereas according to Mr. *Newtons* Theory, no object ſhould appear through both Liquors; becauſe if one tranſmit only Red, the other only Blew, no rays can paſs through both.

Theſe Experimental Exceptions will not, I hope, be unwelcome to Mr. *Newton*, his only aim being the improvement of Natural knowledge, as it is alſo of,

Sir,

Your humble Servant,

Anthony Lucas.

Postscript.

Just upon the close of the adjoyned Letter, I received from Mr. Gascoine, *yours of* May *the fourth; wherein you are pleased to favour us with an exact account of the famous Experiment of the coloured* Spectrum, *lately exhibited before the* Royal Society. *I was much rejoyced to see the Trials of that Illustrious Company, agree so exactly with ours here, though in somewhat ours disagree from Mr.* Newton, *as you will understand by the inclosed impartial account from,*

Sir, &c.

Mr. Newton's *Answer to the precedent Letter, sent to the Publisher.*

Sir,

THe things opposed by Mr. *Line* being upon Trials found true and granted me; I begin with the new question about the proportion of the length of the Image to its breadth. This I call a *new one*; for, though Mr. *Line* in his last Letter spake against so great a length as I assign, yet, as it seems to me, it was not to grant any transverse length shorter than that assigned by me, (for in his first Letter he absolutely denied that there would be any such length;) but to lay the greater emphasis upon his discourse whilst in defence of common Opticques he was disputing in general against a transverse Image: And therefore in my Answer I did not prescribe the just quantity of the refracting Angle with which I would have the Experiment repeated: which would have been a necessary circumstance, had the dispute been about the just proportion of the length to the breadth. Yet I added * this Note, that the bigger the angle of the Prism is, the greater will be the length in proportion to the breadth: not imagining but that when he had found in any Prism the length of the Image transverse to the axis, he would easily thence conclude, that a Prism with a greater angle would make the Image longer, and consequently that by using an angle great enough he might bring it to equal or exceed the length assigned by me; as indeed he might: for, by taking an Angle of 70 or 75 degrees, or a little greater,

* *In my first Letter in* Phil. Trans. N. 122. p. 500.

greater, he might have made the length not only five, but six or eight times the breadth and more. No wonder therefore, that Mr. *Lucas* found the Image shorter than I did, seeing he tried the Experiment with a less Angle.

The Angle indeed which I used was but about 63 degrees 12 minutes, and his is set down 60 degrees: the difference of which from mine, being but 3 degrees 12 minutes, is too little to reconcile us, but yet it will bring us considerably nearer together. And if his Angle was not exactly measured, but the round number of 60 degrees set down by guess or by a less accurate measure (as I suspect by the conjectural measure of the refraction of his Prism by the *ratio* of the signs 2 to 3, set down at the same time, instead of an Experimental one,) then might it be two or three degrees less than 60, if not still less: and all this, if it should be so, would take away the greatest part of the difference between us.

But however it be, I am well assured, my own observation was exact enough. For I have repeated it divers times since the receipt of Mr. *Lucas*'s Letter, and that without any considerable difference of my Observations either from one another, or from what I wrote before. And that it might appear experimentally, how the increase of the Angle increases the length of the Image, and also that no body who has a mind to try the Experiment exactly, might be troubled to procure a Prism which has an angle just of the bigness assigned by me; I tried the Experiment with divers Angles, and have set down my Trials in the following Table; where the first column expresses the six Angles of two Prisms which I used, which were measured as exactly as I could by applying them to the angle of a Sector; and the second column expresses in inches the length of the Image made by each of those Angles; its breadth being two inches, its distance from the Prism 18 feet and four inches, and the breadth of the hole in the Window-shut $\frac{1}{4}$ of an inch.

	The Angles of		*The Lengths of the Image.*
	degr.	*min.*	
The first Prism	56	10	$7\frac{3}{4}$
	60	24	$9\frac{1}{2}$
	63	26	$10\frac{1}{3}$

The

	The Angles of degr.	min.	*The Lengths of the Image.*
the ſecond Priſm.	54	0	$7\frac{1}{3}$
	62	12	$10\frac{1}{8}$
	63	48	$10\frac{3}{4}$

You may perceive, that the length of the Images in reſpect of the angles that made them, are ſomething greater in the ſecond Priſm than in the firſt; but that was becauſe the glaſs, of which the ſecond Priſm was made, had the greater refractive power.

The days in which I made theſe Trials were pretty clear, but not ſo clear as I deſired, and therefore afterwards meeting with a day as clear as I deſired, I repeated the Experiment with the ſecond Priſm, and found the lengths of the Image made by its ſeveral angles to be about $\frac{1}{4}$ of an inch greater than before, the meaſures being thoſe ſet down in this Table.

	The Angles of degr.	min.	*The Lengths of the Image.*
the ſecond Priſm	54	0	$7\frac{1}{3}$
	62	12	$10\frac{1}{2}$
	63	48	11

The reaſon of this difference I apprehend was, that in the cleareſt days the light of the white ſkies, which dilutes and renders inviſible the fainteſt Colours at the ends of the Image, is a little diminiſhed in a clear day, and ſo gives leave to the Colours to appear to a greater length; the Suns light at the ſame time becoming briſker, and ſo ſtrengthning the Colours and making the faint ones at the two ends more conſpicuous. For I have obſerved, that in days ſomething cloudy, whilſt the Priſm has ſtood unmoved at the window, the Image would grow a little longer or a little ſhorter, accordingly as the Sun was more or leſs obſcured by thin Clouds which paſſed over it; the Image being ſhorteſt when the Cloud was brighteſt and the Suns light fainteſt. Whence it is eaſie to apprehend, that, if the light of the Clouds could be quite taken away, ſo that the Sun

Sun might appear ſurrounded with darkneſs, or if the Suns light were much ſtronger than it is, the colours would ſtill appear to a greater length.

In all theſe Obſervations the breadth of the Image was juſt two inches. But obſerving, that the ſides of the two Priſms, I uſed, were not exactly plain, but a little convex, (the convexity being about ſo much as that of a double Convex-glaſs of a ſixteen or eighteen foot *Teleſcope*) I took a third Priſm, whoſe ſides were as much concave as thoſe of the other were convex; and this made the breadth of the Image to be two inches and a third part of an inch; the angles of this Priſm, and the lengths of the Image made by each of thoſe Angles being thoſe expreſt in this Table.

The Angles of the Priſm.	*The Lengths of the Image in inches.*
degr.	
58	$8\frac{1}{2}$
$59\frac{1}{2}$	9
$62\frac{1}{2}$	$10\frac{1}{3}$

In this caſe you ſee, the concave figure of the ſides of the Priſm by making the rays diverge a little, cauſes the breadth of the Image to be greater in proportion to its length than it would be otherwiſe. And this I thought fit to give you notice of, that Mr. *Lucas* may examine, whether his Priſm have not this fault. If a Priſm may be had with ſides exactly plain, it may do well to try the Experiment with that; but its better, if the ſides be about ſo much convex as thoſe of mine are, becauſe the Image will thereby become much better defined. For this convexity of the ſides does the ſame effect, as if you ſhould uſe a Priſm with ſides exactly plain, and between it and the hole in the Window-ſhut, place an Object-glaſs of an 18 foot *Teleſcope*, to make the round Image of the Sun appear diſtinctly defined on the wall when the Priſm is taken away, and conſequently the long Image made by the Priſm to be much more diſtinctly defined (eſpecially at its ſtreight ſides) than it would be otherwiſe.

One thing more I ſhall add: That the utmoſt length of the Image from the fainteſt Red at one end to the fainteſt Blew at the

the other, must be measured. For in my first Letter about Colours, where I set down the length to be five times the breadth, I called that length the utmost length of the image; and I measured the utmost length, because I account all that length to be caused by the immediate light of the Sun, seeing the Colours (as I noted above) become visible to the greatest length in the clearest days, that is, when the light of the Sun transcends most the light of the Clouds. Sometimes there will happen to shoot out from both ends of the Image a glaring light a good way beyond these colours, but this is not to be regarded, as not appertaining to the Image. If the measures be taken right, the whole length will exceed the length of the streight sides by about the breadth of the Image.

By these things set down thus circumstantially, I presume Mr. *Lucas* will be enabled to accord his tryals of the Experiment with mine; so nearly, at least, that there shall not remain any very considerable difference between us. For, if some little difference should still remain, that need not trouble us any further, seeing there may be many various circumstances which may conduce to it; such as are not only the different figures of prisms, but also the different refractive power of Glasses, the different diameters of the Sun at divers times of the year, and the little errors that may happen in measuring lines and angles, or in placing the prism at the window; though, for my part, I took care to do these things as exactly as I could. However Mr. *Lucas* may make sure to find the Image as long or longer than I have set down, if he take a prism whose sides are not hollow ground, but plain, or (which is better) a very little convex, and whose refracting angle is as much greater than that I used, as that he has hitherto tryed it with, is less; that is, whose angle is about 66 or 67 degrees, or (if he will) a little greater.

Concerning Mr. *Lucas*'s other Experiments, I am much obliged to him that he would take these things so far into consideration, and be at so much pains for examining them; and I thank him so much the more, because he is the first that has sent me an experimental examination of them. By this I may presume he really desires to know what truth there is in these matters. But yet it will conduce to his more speedy and full satis-

satisfaction if he a little change the method which he has propounded, and instead of a multitude of things try only the *Experimentum Cancis*. For it is not number of Experiments, but weight to be regarded; and where one will do, what need many?

Had I thought more requisite, I could have added more: For before I wrote my first Letter to you about Colours, I had taken much pains in trying Experiments about them, and written a Tractate on that subject, wherin I had set down at large the principal of the Experiments I had tried; amongst which there happened to be the principal of those Experiments which Mr. *Lucas* has now sent me. And as for the Experiments set down in my first Letter to you, they were only such as I thought convenient to select out of that Tractate.

But suppose those had been my whole store, yet Mr. *Lucas* should not have grounded his discourse upon a supposition of my want of Experiments, till he had examined those few. For if any of those be demonstrative, they will need no assistants, nor leave room for further disputing about what they demonstrate.

The main thing he goes about to examine is, *the different refrangibility* of Light. And this I demonstrated by the *Experimentum Crucis*. Now if this demonstration be good, there needs no further examination of the thing; if not good, the fault of it is to be shewn: for the only way to examine a demonstrated proposition is, to examine the demonstration. Let that Experiment therefore be examined in the first place, and that which it proves be acknowledged, and then if Mr. *Lucas* want my assistance to unfold the difficulties which he fancies to be in the Experiments he has propounded, he shall freely have it; for then I suppose a few words may make them plain to him: whereas, should I be drawn from demonstrative Experiment to begin with those, it might create us both the trouble of a long dispute, and by the multitude of words, cloud rather than clear up the truth. For if it has already cost us so much trouble to agree upon the matter of fact in the first and plainest Experiment, and yet we are not fully agreed; what an endless trouble might it create us, if we should give our selves up to dispute upon every Argument that occurs, and what would become of Truth in such a tedious dispute?

The way therefore that I propound, being the ſhorteſt and cleareſt (not to ſay, the only proper way,) I queſtion not but Mr. *Lucas* will be glad that I have recommended it, ſeeing he profeſſes, that it is the knowledge of *truth* that he ſeeks after. And therefore at preſent I ſhall ſay nothing in anſwer to his Experimental diſcourſe, but this in general; that it has proceeded partly from ſome miſunderſtanding of what he writes againſt, and partly from want of due caution in trying Experiments; and that amongſt his Experiments there is one, which when duly tried, is, next to the *Experimentum Crucis*, the moſt conſpicuous Experiment, I know, for proving the different refrangibility of Light, which he brings it to prove againſt.

By the *Poſt-ſcript* of Mr. *Lucas*'s Letter, one not acquainted with what has paſſed, might think, that he quotes the Obſervation of the *R. Society* againſt me; whereas the relation of their Obſervation, which you ſent to *Liege*, contained nothing at all about the juſt proportion of the Length of the Image to its Breath according to the angle of the Priſm, nor any thing more (ſo far as I can perceive by your laſt) than what was pertinent to the things then in diſpute, *viz.* that they found them ſucceed as I had affirmed. And therefore ſince Mr. *Lucas* has found the ſame ſucceſs, I ſuppoſe, that when he expreſſed, that *he much rejoyced to ſee the Trials of the* R. Society *agree ſo exactly with his*, he meant only ſo far as his agreed with mine.

And becauſe I am again upon this firſt Experiment, I ſhall deſire, that Mr. *Lucas* will repeat it with all the exactneſs and caution that may be, regard being had to the information about it, ſet down in this Letter; and then I deſire to have the *length* and *breadth* of the Image with its *diſtance* from the Priſm, ſet down exactly in feet and inches, and parts of an inch, that I may have an opportunity to conſider what relation its length and breadth have to the Suns diameter. For I know, that Mr. *Lucas* Obſervation cannot hold where the refracting angle of the Priſm is full 60 degrees, and the day is clear, and the full length of the Colours is meaſured, and the breadth of the Image anſwers to the Sun's diameter: And ſeeing I am well aſſured of the truth and exactneſs of my own Obſervations, I ſhall be unwilling to be diverted by any other Experiments, from having a fair end made of this in the firſt place. *Sir, I am, &c.*

Poſt-

Postscript.

I Had like to have forgotten to advise, that the Experimentum Crucis, *and such others as shall be made for knowing the nature of Colours, be made with Prisms which refract so much, as to make the length of the Image five times its breadth, and rather more than less; for, otherwise Experiments will not succeed so plainly with others as they have done with me.*

An Account of two Books:

I. *Tractatus de* VENTRICULO & INTESTINIS, *cui præmittitur alius de* PARTIBUS CONTINENTIBUS *in genere, & in specie de Partibus* ABDOMINIS; *Auth.* Franc. Glissonio, *M. D. &* Coll. Med. Lond. *Socio, nec non* Soc. Regalis *Collegâ.* Londini, 1676. *in quarto.*

THe eminently learned Author of this Anatomical Treatise, having presupposed the general Divisions of the parts of an Human Body, taken in their largest sense, and their inadequate conceptions, upon the account of which they are in divers respects called Similar or Organical, proceeds directly in this work to the Inferiour and more Practical divisions of the said Body.

And having first of all divided the Lowermost *Venter* into its Regions, and designed the parts contained in each of them; he goes on to the division of the *Cutaneous* parts, and considers the nature, structure, origin, vitality, and uses of the *Cuticula* and *Cutis vera*. Where we cannot but take notice, that the Author, as well here, as throughout this whole piece, builds much upon the grounds, he had laid in the Book, he published four years ago, *de Vita Naturæ*, wherein he ascribes much to *Natural Perception*, which he holds to be an Operation anterior to, and more general and more simple than that of, *Sense*; and in which Perception, accompanied with Appetition and Motion, he makes *Original Life* to consist, which, to him, is nothing else but the Energetical or Operative nature of any Being subsisting by it self, not producible by any external power, motion, texture, figure, organization or proportion of parts, but by the sole

First Cause of all things. Without the help of which Natural Perception he sees not, how (*e.g.*) the command of the Imagination can be made known to the Muscles, that do execute them at the beck thereof: Nor, how the Plastique power forms a Chick in an Egg, &c. But to leave this Notion to the Judgment of Sagacious Readers, we take further notice of our Authors opinion, concerning the manner of *Transpiration*, which he affirms to be made not so much through the *Pores*, as the very *substance* of the skin, and yet denies this kind of perspirability to infer a penetration of *Bodies*, though it do of *Substances*, by a change of quantity.

Having done with the Skin, he discourses of the *navi* or marks in the skin, as also of *Nails* and *Hair*, of what they have common with the skin, and wherein they differ; why Man is born naked; what Colours do belong or not belong to Hair; endeavouring to explain, why the Hair of Animals, though it be referred to the family of Plants, yet neither are green, nor blew, nor purple; and why the Feathers of Birds are; adding withal the cause of Curled-hair, and the general causes of the Fall of hair.

Next, he treats of the *Adeps* or Fat, and is inclined to believe, that it proceeds rather from the *Succus nervosus*, than the mass of the Blood. Then he passes on to the *Muscles* of the abdomen; and there takes occasion, amongst many other things, to discuss that famous question concerning the Inosculation of the Epigastrick vein with that of the Breasts; acknowledging that there are such *Anastomoses*, but denying that the consent between the Womb and the Breasts (which yet he also grants) depends thereon. To this he subjoyns the History of the *Peritonæum* and *Omentum*, declaring their structure and uses, and examining particularly, whether the *Omentum* be the Seat of the Hypochondriacal winds, and the Sink of the body?

Having dispatched this first Part, he proceeds to the other Part of this Treatise, and therein delivers the History of the *Gullet*, *Stomach*, and *Guts*: In the doing of which, he discusseth many considerable Questions; *E.g.* which Animals have *gullets*, and which not? What is the manner of *Rumination*, and why some Animals have more stomachs than one? Whether in the stomach there be *Lymphaducts* distinct from the *Lacteals*? What

is

is the matter, ſtructure, tenacity, tenſibility, flexibleneſs, vitality, and various uſe of *Fibres?* Whether there be a natural Perception in them? How the *Irritability* in Animals is governed and directed by the Imagination and the inward Senſitive Appetite; together with the manner, how the Imagination and Appetite move the Muſcles? What kind of Motion it is, wherewith the Brain excites the Nerves; and how the ſame comes to move ſome Muſcles, and not others? What the Animal ſpirits contribute to the motion of the Muſcles? Whether the Stomach and Guts have a *parenchyma*, and, if ſo, whether that be glandular? Why the *cæcum* in Man is leſs than in other Animals; and why it is double in winged Creatures? &c.

Diſcourſing of the Actions and uſe of the Gullet, Stomach, and Inteſtines, he firſt examines the nature of *Hunger* and *Thirſt*, and inquires, whether they differ ſpecifically from the five Senſes? where occaſionally he maintains, that the ſenſe of *Touch* differs more than in degree from the other ſenſes; and explains, how the pain of Touch differs from the pain of Hunger; adding, that the ſenſe of *Taſt* hath more affinity to Hunger, than that of *Touch*. Concerning *Thirſt*, he conſiders, among divers other particulars, that one of the general cauſes thereof is the defect of the *latex*: whence he takes occaſion to ſpeak of the meaning given by Van *Helmont* to that liquor, commending, on the occaſion, that Gentlemans *induſtry*, *ſagacity*, and *ſincerity*, but blaming withal his proneneſs of *inveighing* againſt others.

This done, he goes on to the conſideration of the *Periſtaltique* Faculty, and the various motions thereof; as alſo of the powers of *Suction*, *Deglutition*, *Attraction*, *Retention*, *Coction*, *Diſtribution* of the *Chyle*, *Secretion*, *Excretion*, *Flatuoſity*: Concluding the whole with an *Appendix* about *Fermentation*. In all which there occur many notable Diſquiſitions; *E.g.* What are the Requiſites to a *Periſtaltique* power? What the organs of *Suction?* What the proper actions of *Deglutition?* Whether there be any ſimilar *Attraction?* Wherein conſiſts the *Retentive* power? Whether the Stomach be the only ſeat of *Digeſtion?* What is the principal means of *Digeſtion*; whether it be, (as *Mæbius* would have it) a *ſpirituous* and *pungent Salt*; and if ſo, what is the manner of its operation? What degree of *Heat* is required to Digeſtion, and whether *Heat* alone be ſufficient for it? What are

the

the causes of *Seeds* and *Eggs*? Whether the approbation of the *Idea* of a nature to be introduced must be precedent to generation? How the Consent between the parts of *Generation*, and the *Imagination* and *Appetite* of an Animal is performed? What natural *Instinct* is? What the *Archeus* is, and how it differs from an inbred simple Spirit? Further, as to the matter of the *Chyles* Distribution; how the Stomach dismisses the *Chyle*? How far the *Chyle* is imbibed by the Milky vessels; and whether that imbibition is made by a *parenchyma*? How the *pituita* is secreted? What are the Ages of *Blood*; and how *exolete Blood* falls asunder? What are the Stimulating causes for *Excretion?* Where he discourseth amply and learnedly of the several sorts of *Expulsion*, of *Crudities*, *Emeticks* and *Abstersives?* Again, concerning *Flatus's*; what is the matter, and what the signs of them? How many their kinds and causes? What are the most proper discutients of them? Wherein the Hypochondriac *Flatus*'s do consist? Which are the parts affected in *Rheumatisms*, together with a considerable cure of a *Rheumatism* performed by the Author? Lastly, as to *Fermentation*; What are *Imaginary* and what *Genuin Ferments?* What is a *Malign*, and what a *Febrile Ferment?* What are the bounds of the beginning, increase, height and decay of *Fermentation?* &c. For these and many more Disquisitions, handled by our Author, we must refer the Reader to the Book it self.

PHAR-

II. *PHARMACOPEE Royale, GALENIQUE & CHYMIQUE, par* Moyse Charas, *Apoticaire Artiste du Roy en son Jardin Royal des Plantes. A* Paris, 1676. *in quarto.*

THis Work of the industrious and experienced Monsieur *Charas*, hath the Approbation both of the Illustrious *Parisian* Faculty of Physick, and of the most eminent Physicians of *Paris*, such as are the first Physicians of that King and Queen, the *Dauphin*, and Monsieur the Kings Brother; who give this Testimony to it, that it contains both what is found best in the Ancients, and what has been discovered by the Moderns in *Pharmacy*, and that therefore it may be very useful to all those that addict themselves to the study and practice of Physick.

The whole Piece is divided into three Parts: The *first*, treats of *Generals*, such as the Subject, Object, End and Principles of *Pharmacy*, both Galenical and Chymical; as also of *Medicines*, and their power in general; of the Choice of the *Materia medica*, and of the Place and Time fit for that choice: likewise of the Preparation of *Medicaments*, under which he comprehends *Lotion*, *Trituration*, *Infusion*, *Coction*, *Fermentation*, *Digestion*, *Circulation*, *Cohobation*, and many more. To which he adds a Discourse of the *Fire* and its Degrees, of divers sorts of *Furnaces* and *Cements*, as also of the Instruments and Vessels of both *Pharmacies*, and the way of cutting Glass-vessels, together with the Weight and Measures used in *Apothecary* Shops.

The *second*, treats of the *Galenical* Preparations and Compositions, all prescribed or examined and corrected by his *French* Majesties First Physician; many of which the Publisher affirms to be both assured and curious. This part hath two Books; the former of which considers such Preparations as are used inwardly; the latter, such as are applied outwardly: In both which the Author insists most on matters of greatest importance, and delivers things that are most grounded upon Experience and Reason.

The *third* is spent in the *Chymical* Preparations of Medicines, whether the matter of them be *Vegetables*, *Animals* or *Minerals*: which sort of Preparations the Author judgeth to penetrate more into the inner parts of the Mixt Bodies, by a dextrous solution

ſolution of the parts that compoſe them, and by freeing them of the impurities which our ſenſes perceive not, whereby the pure ſubſtances, which are the principal and moſt eſſential parts, being diſengaged, may with more efficacy and ſpeed produce the effect looked for. And this is performed in three Books, according to the three, lately named, claſſes of Materials. In the doing of which the Author affirms, that his chief aim being to make known the ſureſt and the eaſieſt means of ſucceſsfully performing all *Chymical Operations*, he doth ſincerely communicate what himſelf practiceth, without any reſerve, and endeavours ſo to explain himſelf in thoſe Preparations that have paſſed through his hands, that by making thoſe to be well underſtood, it will not be difficult to ſucceed in ſuch as he hath not ſpoken of. And he hopes, that, having in his ſaid Preparations conſulted Experience und Reaſon, and avoided affected prolixities, he ſhall not be blamed for ſo doing, and that it will be well taken, that he hath eſtabliſhed their vertues, doſes and uſes *upon* the principal parts of which the Mixts are compoſed, *upon* the ſeveral alterations which they receive in preparing them, and *upon* the Succeſſes which he hath noted of them in the ſeveral uſes he has made of them in very many occaſions.

Advertiſement,

To intimate, that the Publiſher of this Tract intends to take another opportunity of Juſtifying himſelf againſt the Aſperſions and Calumnies of an immoral Poſtſcript put to a Book called Lampas, *publiſht by* Robert Hooke: *Till which time, 'tis hoped, the Candid Reader will ſuſpend his Judgment.*

Errat. Pag. 685. lin. 6. leg. KPL pro KLP.

Imprimatur,

Octob. 3. 1676.

Brouncker, P.R.S.

London, *Printed for* J. Martyn, *Printer to the* R. Society, 1676.

PHILOSOPHICAL TRANSACTIONS.

Novemb. 20. 1676; *for the Months of October and November.*

The CONTENTS.

Observations concerning some of the most considerable parts of Asia. *Two Contrivances of* Hygroscopes, *by Mr.* Coniers; *anterior to that, which was published* N. 127. *The Occultation of the Planet* Mars *by the Moon, observed by Monſ.* Hevelius, *Mr.* Flamſtead *and Mr.* Hally. *Two Letters concerning* Rock-Plants, *their Figures and Growth. An Account of some Books:* I. Ephemeridum Medico-Phyſicarum Germanicarum Annus IV. & V. II. *Nouvelle Methode en Geometrie pour les Sections des ſuperficies Coniques & Cylindriques, &c.* III. *Ophthalmographia, A.* Gu. Briggs *A.M.* IV. *Longitude found by* H. Bond *Sen.*

Observations concerning some of the most considerable parts of ASIA.

FOr these Observations, as they are to follow, we are obliged to that great Traveller, Monsieur *Jean Baptiste Tavernier*, who having made six Voyages into *Turky*, *Persia*, and the *East-Indies*, (five of which were by him performed by Land,) hath lately published the same in two Volumes in *quarto* at *Paris*. The first whereof, (to be only taken notice of in this Tract) contains 1. The different Roads passable from *Paris* to *Ispahan*, through the *Northern* Countries of *Turky*: 2. The several Roads from the same City of *Paris* to *Ispahan* through the *Southern* Provinces of *Turky*, and through the Desert: 3. The Roads passable into *Turky* and *Persia* through the *Northern* Provinces of *Europe*; where occurs a particular Relation of divers Countries neighbouring to the *Black* and *Caspian* Seas: 4. A Description of *Persia*, its Inhabitants, Productions, Government, Customs, Arts, Manufactures and Commodities.

Some of the Observations themselves:

1. That *Ispahan* is about the bigness of *Paris*, but that *Paris* hath ten times more people than *Ispahan*.

2. That the Air of *Gomron* from the month of *April* to that of *November* is so unhealthy, that it breeds a very malign Fe-

ver, which, if it kill not, is followed with the Jaunders for the remainder of the Patients life: And, that after the end of *March* the wind changeth, blowing for the most part from the West or Southwest, and being sometimes so hot and suffocating, that it takes away respiration: whence the *Arabians* give it the name *El-Samiel*, that is, a *Wind of poyson*. And, which seems very strange, if one take an arm or a leg, or any other part of the body, that hath been newly stifled by that suffocating wind, it remains in the hand like Greale, and as if the body had been dead a month before. The same kind of Air is, according to this Author, about *Mousset* and *Bagdat*; concerning which he relates, that, travelling once upon the road from *Ispahan* to *Bagdat*, he had been stifled, if he had not been in the company of some *Arabian* Merchants: But these, as soon as they perceived this wind coming, presently made him light from his Beast, and throw himself, together with them, flat upon the ground on their bellies, covering themselves well with their Cloaks. In which condition having remained for half an hour, and on much ado saved themselves from being suffocated, they rose up, finding their Horses muck-wet all over, and so faint, that they were not able to carry their Riders. But, when men are upon some River, though the same wind do blow in the same season, it doth no harm, though people were stark naked. He saith further, that sometimes the blast is so hot, that it burns as if Lightning had passed.

3. That all the precious Oyls, Confits and Unguents, that our Author had been presented with by the Great Duke of *Toscany*, did, when he came into those hot Countries, boyl from the heat reigning there, and even break the bottles that contained them: And particularly, that of 24 boxes of Treacle, that were fast screwed, not one escaped whose bottom was not burst out.

4. That in *Persia* few Children have the small Pox, but, instead thereof, most of them are troubled with the Scurff on the head, till they are 10 or 12 years old.

5. That the *Persians* know nothing of the Gout or Stone; only the *Armenians*, who drink more wine than water, are troubled with the latter of those two diseases.

6. That the *Persians*, especially the better sort of them, are far less subject to sickness, than the *Europeans*, because they fail not in Spring to take inwardly a decoction of the wood of *China*, which

which is a Root coming out of *China*, and by our Author said to be a kind of Rhubarb, an excellent Preservative of health. This root they let boyl for several days in water, according to the dose prescribed by the Physician. *E.g.* the first day they put one ounce of it in three pints of water, increasing the dose of the Root every day unto the twelfth, and thence to the twentieth day. This drink is said to be very agreeable to the taste, and of the colour of our pale wines. Whilst they are drinking this decoction, they must eat nothing but a little bread, and a roasted Chicken without Salt; and after they have done drinking, they must forbear eating Fruit a whole month. When this Drink is taken, the person that hath taken it must be very well covered to sweat; of which sweat, which is copious, his linnen becomes all yellow, and even all the walls of his Chamber. This Root easily spoils, and whilst 'tis good, the Author saith a pound of it costs an hundred Crowns.

7. That all the Women of the Turkish *Seraglio* are frequently chawing Mastic, as that which takes away the impurity of the Teeth, and keeps them clean and white.

8. That when the *Nogaies*, a sort of Tartars, have received any wound, they use no other oyntment but some boiled flesh, applied hot to the wound. And when the wound is deep, they thrust in a piece of fat as hot as the Patient can endure it: And for this purpose they count the flesh and fat of Horses best of all.

9. Those that are troubled with the Colick, are order'd to eat Horse-flesh; which they say cures many.

10. That 'tis very true, that near the Isle of *Baharen* they fetch sweet water from the bottom of the Sea; and that about Cape *Comorin* and along the coast of *Coromandel* and *Malabar*, where no sweet water is, the people come with their vessels at the time of Low-water as near to the Sea as they can, digging about two foot in the Sand, where they meet with sweet water good to drink.

11. That Camels bear their young ones Eleven months, and can be without drink many days, even to nine, and that the bigger sort of them are able to carry a 1000, yea 1500 pound weight. That their Milk is a soveraign remedy against the Dropsie.

12. That the Cows about *Balsara*, having no grass to feed on,

are fed with the heads of Fiſhes and Dates boiled together.

13. That the Palm-trees in the Country of *Balſara* are thus propagated. They dig a hole in the earth, in which they range 250 or 300 Date-kernels, one a top of another pyramid-wiſe, with the point upwards, ſo as that the pyramid ends in one kernel: Which being covered with earth, the Tree grows up.

14. That Craw-fiſhes do creep up on high of the white Mulberry-trees about Sun-ſet, eating the fruit; and at break of day come down again into the Rivers, near which thoſe Trees grow.

15. That Porcupins kill Lions, by darting into their body their quills.

16. That all along the Gulph of *Perſia* there are vaſt numbers of a kind of Locuſts, which are edible, and of which our Traveller affirms that he opened one that was ſix inches long, and found 17 little ones in its belly, all of them ſtirring.

17. That there is a *Talc* in *Perſia*, which being beaten into pieces as ſmall as Lentils, and tinged with what colour they pleaſe, they mix it with Chalk well ſleaked, and rubbing their walls with it, make them ſhine Jaſpis-like, which is very agreeable to the eye.

18. That on the weſt of the *Caſpian* Sea, a little above *Chimaki*, there is a Rock advancing out upon the ſhoar, whence drops an Oyl, of which the *Perſians* make a Vernis, by infuſing in it ſome drops of Maſtic. This oyl whilſt iſſuing out of the rock is as clear as water; but afterwards thickens by little and little.

19. That the beſt Glue in the world is made of *Sturgeon*, it being ſo ſtrong, that you ſhall ſooner tear the matter thus glued any where elſe than in the place where 'tis glued. The manner of the Turks in preparing it is this: When they have taken out the garbage of the fiſh, they meet with a certain skin that covers the fleſh; and this they pull away from about the head to the end of the belly. This skin is very glutinous, and of the thickneſs of two paper leaves: This they roll up to the thickneſs of a mans arm, and ſo put it to dry in the Sun: And when they will uſe it, they beat it with an hammer, and being well beaten they break it into little bits, which they put and keep in water for about half an hour in a little pot, and ſo ſet it over a gentle fire, ſtirring it continually till it become liquid, and taking heed of keeping it from boyling, which would utterly ſpoil it.

20. That

20. That the *Persians* are exquisitely skilful in damaskining with Vitriol; but that the nature of the Steel by them used contributes very much to the good workmanship, they not being able to do so well with their own or our Steel. This Steel they fetch from *Golconda*, which is the only kind known that can be well damaskined. And 'tis very differing from ours: For, when 'tis put to the fire to temper it, they very carefully give it only a little redness like that of a cherry-colour, and instead of quenching it in water, as we do, they only wrap it in a wet piece of Linnen cloth; for, if they should give it the same degree of heat that we do to ours, it would grow as brittle as glass.

21. That the *Persian* Countrymen about *Ispahan*, coming every morning to fetch away all manner of the ordures of the Town to dung their land withal, take up much rather the excrements of the *Armenians*, *Jews* and *Franks*, because they drink wine, than those of the *Persians*, that generally drink none.

22. That in *Persia* they make the running of Foot-men a Trade, by breeding them up to it, and with solemnity receiving him for Master of the Trade who performs the Master-piece of running 36 common Leagues in a day, from Sun-rising to Sun-setting.

So far the Observations of the first Volume; *those of the* second *we shall reserve for the next opportunity.*

A Description of Mr. John Coniers, *Apothecary and Citizen, his* Hygroscope, *in two several Contrivances; together with some Observations made thereon: Communicated in a Letter to the Publisher*, Octob. 23. 1676.

SIR,

I Thought it necessary to acquaint you, that in my diversions, among many (at least 40) several Trials, made by me for the readiest and best discovery of the Change or Temperature of the Air and Weather, I have found out, that by applying a Hand and a Circular Index or a Quarter-circle to a Pannel made of duly seasoned Deal-wood, and that divided or slit in two parts playing loose in a groove, and only fastned to the frame at each end (as you may see by the figures, accompanying these lines,) you have one of the best, if not the very best contrivance for that purpose. I have made two several Contrivances of it; the one I invented and contrived about five or six years since; here explained in the first Figure, together with some Observations,

tions, by me made thereon during that time; the other, some years after the former: Both which I thought fit to communicate to you, to dispose of them as you shall think good.

So far the Letter: Which, together with the Invention and Contrivance it self, therein mentioned, the Publisher would have given notice of ere this, and at the time, when in *N.* 127. of these Tracts the like Invention, imparted from *Dublin*, was described, if he had not then been altogether un-acquainted therewith. Wherefore, to do right to the Ingenuity of this Inventor, the Description of this his Instrument, in its two several contrivances, shall now be faithfully set down here, together with the Observations made by the former of them.

The Explanation of the first Contrivance in Figure I.

AAAA, The Frame of wood for the two pannels of Deal to play loose in at top and bottom, to which at the two ends they are fastned.

BB, The two pannels of slit-Deal, three foot deep, and three foot broad apiece, with a distance left in the middle for the scope of the motion.

C, The Hand placed or fastened by the Axletree to the plate, and also with Nail-holes which are to fasten it to the middle of the Pannel within half an inch of the scope for motion; at the lower or shorter end of which Axletree there is, by a wire like an S, fastned a small Silver-chain within a straws breadth of the Axletree; which Chain is to be carried and placed cross the distance between the two pannels, and fastned to the Pannel opposite by a brass-noose, through which it is to slip, so as that it may be taken up or let down at pleasure.

D, The Roller with a weight annexed, which by a string is fastned to the lowest end of the hand C; so that as the Relax gives way, the Weight will adjust the motion of the hand to the Index E.

E, The Index of Paper, pasted upon the opposite pannel to the hand, and so, as it is in this figure, placed near the top, for the better advantage of the Hands motion; and this Index, being but a quarter of a Circle, is divided into inches more or fewer according to the scope which the Pannels hand requires for their motion; but when the Relax shall require more room for the hand, then the chain is to be taken up one link more, and

so

ſo you will be ready for more play upwards and downwards: Which taking up may yet be again repeated, when there is occaſion, or the time of year requires it.

Now if the Chain be placed near the Axletree, the motion will be the nicer and larger; if farther off, then it will be leſs: For Example, the motion of 2 more than that of 3, and 3 than that of 4, &c. as you may perceive by the figures 2, 3, 4, 5, 6; which are placed in this figure by the lower end of the hand near below the Axeltree thereof.

From this contrivance it was, that I have for this five or ſix years paſt made theſe following Obſervations.

1. That theſe Pannels of Deal-wood will move by ſhrinking moſt in Summer, and ſwelling moſt in Winter-ſeaſons; but will vary from this, according to the change to the then more or leſs heat or cold, moiſture or drought that the temper or ſeaſon of the year, ſuch as Spring and Fall, do produce; it being then more apt to ſwell or ſhrink on the ſudden, but not attaining then to the higheſt ſhrinking or ſwelling, as in Summer and Winter it doth.

2. That for the moſt part, eſpecially in the Spring and Summer-time, this Motion happens only in the day time; for then generally all night it reſts, and moves very ſeldom.

3. That one kind or manner of this Motion happens in dry fair weather, but ſometimes in the fore-part of the forenoon, and ſometimes not until the latter part of the forenoon, and then at that time it relaxes or ſwells the Deal for about two or three hours; more, ſeldom; leſs, often; and then all the afternoon after ſhrinks; nay, ſometimes even when a ſmall Rain hath newly fallen, or is then falling; and this not ſo often, but more ſeldom in Winter, or cold moiſt weather.

4. This ſhrinking is gradual very often, or for the moſt part a little after a moiſt time (*viz.*) the firſt day after moiſture it ſhrinks a little, the ſecond day more, and ſo yet more according to the then time of year, and as it is then inclined to moiſture or drought, and alteration of the wind and the then heat or cold.

5. The winds being in the North, North-Eaſt, and Eaſt, winter and ſummer, for the moſt part at that time the Deal ſhrinks in the night alſo as well as in the day; but not ſo much: which is a ſign of drying weather, and ſometimes of froſt or cold in Winter; heat or ſcorching in Summer, in a clear day. But on the contrary, the South-

Southwinds blowing, or the Weſt and South-weſt, the Deal then alwaies relaxes that day, or at leaſt is at a ſtay, provided this happen in the day time; for then, if in the night, not ſo much; and ſo this will do ſome conſiderable time before Rain.

6. By a conſtant obſervation of this Experiment of the Deals Motion and Reſt, you may be able to know or gueſs at the Winds ſcituation without a Weather-cock, provided you have by you a common and a ſealed *Thermometer*.

7. Alſo you may know the time of Year; for in the Spring it moves quicker and more than in Winter; in Summer it is more ſhrunk than in the Spring; in Autumn leſs in motion than in the Summer. Other Obſervations may be made more nice; theſe only in general at preſent.

Only I ſhall add this following Experiment with a Conjecture from thence. Conſidering with my ſelf, that a Fagot or other Wood laid upon the fire, the heat then viſibly cauſes moiſture to come out of the Ends only. This occaſioned the making of the following Experiment, to find whether then the moiſture was not rarified out of the ſmall Cylinder, like ends of the wood, only, or out of the ſides alſo.

I took therefore ſeaſoned Deal, two pieces, weighing the one piece and the other the night before; but the *ends* of the one piece I cloſed up with *Diachylon Plaſter*, but the *ſides* of this Deal I did not ſo cloſe up; but left theſe ſides with the other piece without *Diachylon*. Both being expoſed to the open Air, they were found the next day both of them alike to have increaſed in proportion of Weight, which ſeems to prove, that the Sides alſo do take in and let out Moiſture. Yet it doth appear, that in warmer weather Moiſture paſſes freeſt and more out of the Ends of the wood, than it doth in colder weather.

From whence I do conjecture, that Deal-wood, as it hath a fit texture and body for *moiſture* and *drought*, *heat* and *cold* and ſuch like qualities to be diſcovered thereby, ſo it doth much like the ſame thing with what is alſo performed by the whole body of the outward maſs of this globe of Earth; as may be made appear by forty other Experiments, not commonly known; yet this varying according to the time of year, and clime in Longitude and Latitude.

The Explanation of the Second Contrivance, by a Circular Motion for an Annual Revolution; and first *in the* Outward *parts; represented in Fig.* II.

AAAA, The frame of wood, for the Pannels of Deal to play looſe in, at top and bottom.

BBBB, The Croſſes of Deal or Iron faſtened to the frame on each ſide; to which is annexed the Circular Index divided into 12; in the Center of which the Axletree *b* for the hands is placed.

CC, The two Pannels of ſlit-Deal, 3 foot deep, and 3 foot broad, apiece; faſtened at each end of the Frame, with a diſtance left in the Middle for the ſcope of the Motion.

The Explanation of the Inward *work in Fig.* III.

AA, The two hands.

BB, The two Braſs Pullies or Rollers, the one bigger, the other leſs; to the bigger a flat Leaden-weight is faſtened with a Cat-gut ſtring; to the ſmaller is faſtened a ſmall Silver-chain, which is by the Nooſe or loop of the braſs *C* to be faſtened to the Pannel under the middle of the croſs, near the gap or ſcope for the Motion; and in that nooſe the Chain to have a faſtening to be taken up or let down at pleaſure.

D, The Roller or Pully to be placed on the other Pannel oppoſite to the Nooſe, and near the gap or ſcope betwixt the two Pannels; over which Roller the ſmall Chain, upon its return to the Axle-tree, is to be placed.

E, The Axletree upon which the two Rollers or Pullies *B b*, are to be faſtened, and the two hands *A A* for the Index.

F, The Weight annexed to the biggeſt Roller or Pully *B*, and the ſtring or Cat-gut to be moved, is to have the contrary poſture for motion to the ſmall Roller or Pully upon which the Silver-chain is faſtened: ſo that, as the ſhrinking of the Pannel moves the Axletree one way, the Relaxing may give way to the moving the hands or Axletree the other way by the power of the Weights drawing; which contrary poſtures will give the niceſt account of this Motion.

Note, that the circumference of the ſmalleſt Pully or Roller *B b*, upon which the Chain is faſtened, is to be no bigger than juſt ſo much ſcope or diſtance as the two Pannels make by the extremity of their utmoſt ſwelling or ſhrinking; and ſo one full revolution of the hand upon the Index may anſwer the fulleſt ſhrinking and ſwelling in the year, and the diſtance between the two Rollers or Pullies fixed upon the Axletree muſt be the thickneſs of your Pannels; ſo that the Weight is to play or move on the one ſide of the Pannel, and the Chain on the other, without diſturbance or rubbing againſt the ſides of the Pannel or the Croſs, between which, out of ſight, in the middle they are to be placed.

This way was ſo contrived before this time twelve-month, in the year 1675; ſome years after the former; and ſo with Chain and Pullies to avoid the ſhaking that would happen by applying the work of Pinnion and teeth to move the hands; which was then alſo propounded to Mr. *Tompion* the Watchmaker, but by him rejected, though I think that way may be uſed alſo with a Weight added to regulate the motion.

Now, as to the degree, to which the Deal-board, which ſhall ſerve for theſe Inſtruments, is to be ſeaſoned, and for the kind, of which the ſame ought to be, you muſt take the fineſt ſtreighteſt grain of your Dram deal, as the beſt for this uſe, and let it lie drying in your houſe two or three years. And to know, whether it be ſufficiently ſeaſoned for this Inſtrument, take a ſmall part thereof, and weigh it in a nice pair of Scales, and, if you find the weight thereof not to have increaſed many grains in wet weather, nor decreaſed many grains in dry, you may then conclude this Wood to be fit for your purpoſe.

Occultatio *Martis* & quarundam Fixarum observata *GEDANI*, Anno 1676, die 1. *Sept.* st.n. mane, Tubis inprimis 12. & 20. pedum

à

Joh. Hevelio.

DIE 31 Augusti, *aër omninò nubilosus, imò circa vesperam pluvius extitit, sic ut vix spes aliqua superfuerit Conjunctionem hanc arctissimam Lunæ & Martis observandi; nihilominus tamen, cælo circa mediam noctem undique sereno, observatio hæc notabilis, Lunâ pene dimidiatâ existente, ex voto succesſit; ut non solùm* ingressum *Martis sub Lunam exactissimè, sed etiam* egressum *ejus omnium optimè animadvertere nobis obtigerit; uti ex appositâ observatione liquet. Initium accidit secundùm horologium Oscillatorium, ex altitudinibus Fixarum correctum, horâ 1.35'.42", atque Finis horâ 2.46'.29".* Mars *verò obtectus est circa Montem Audum, incedens quasi per loca Lunæ Paludosa, per M. Ætnam, infra Insulam Lesbicam, supra Paludem Acherusiam, supra M. Coraeem, per Paludem Mœotidem, & paulò supra Insulam Alopeciam & ipsum Lunæ centrum; sicque rursùs ad Lacum majorem occidentalem exiens.*

Si quæras, unde viam itinerariam hanc adeò accuratè mihi determinare licuerit, & quidem ad partem Lunæ obscuram, scias, eò evenisse, quod Tubis illis meis præcipuas Maculas Majores in parte Lunæ umbrosâ satis distinctè deprehendere potuerim; atque ita dilucidè conspexerim, Martem circa medium ferè Paludis Mœotidis emicuisse.

De cætero notandum occurrit, paulò post Martis egressum, aliam insuper stellulam fixam b, *globo aliàs nondum adscriptam, vix ad 3' minut. prim. infra Martem versùs Austrum, horâ nimirùm 2.53'.35". exiluisse circa Paludes amaras; quam quidem Lunam subire haud animadverti: cùm totus in eo fuerim, ut Martis momentum Occultationis præcisè determinarem; atque sic etiam alteram stellulam* c *Lunam appropinquare haud deprehendi, quam posteà circa Martis exitum horâ scilicet 3.42'.20", ad cornu Lunæ inferius ad 4' ferè minut. remotam primùm conspeximus. Quantum colligere datur stellula hæc* c *à Lunâ non omninò tecta est, sed Luna eam solummodò quasi margine suo strinxit. Nihilominus spectaculum fuit admodùm jucundum, cælo perquàm sereno, non*

tantùm Martem prorsus occultatum, nec non alteram stellulam itidem planè tectam, sed pariter alteram stellulam limbo Lunæ adeò arctè conjunctam vidisse; & quidem circa Lunam à Quadraturâ ultimâ recentem, ejusque partem obscuram rursùs exilientes.

Adhæc plures quidem stellulas incognitas circa Lunam conspeximus; verùm cùm illæ parùm ad hancce observationem faciant, eas typo nostro haud adscripsimus.

Tabulæ Rudolphinæ quæ nonnunquam evidenter à cœlo discrepant, hanc insignem Martis Occultationem satis præcisè indicarunt. Siquidem initium Occultationis vix ad 5 minut. prim. diversam commonstrarunt, & in fine, & durationè non nisi ad 3' ferè minut. anticipando videlicet, aberrarunt.

Occultatio *Martis*, & nonnullarum Fixarum

observata

GEDANI,

Anno 1676, die 1. *Septemb.* st.n. mane;

à

Joh. Hevelio.

Temp. secund. horol. oscil. Hor. ′ ″	*Fixarum Nomina.*	*Altitudines.* ° ′ ″	*Temp. ex altit. corr.* Hor. ′ ″	*Animadvertenda.*
1 1 25	Caudæ Cygni.	57 10 0	1 0 24	
1 9 45			1 8 45	☽ *distabat ferè tanto interstitio à limbo* ☽ *lucido, quanto M. Porphyrites in M. Ætna removetur.*
1 36 39			1 35 42	*Mars à Lunâ omninò tectus.*
1 45 25	Caudæ Cygni.	51 17 0	1 44 7	
2 47 54			2 46 29	*Mars emicuit; finis nempe occultationis.*
2 55 0			2 53 35	*Alia stellula fixa* b *sub Marte egreditur.*
3 19 50	Scheat Pegasi.	45 3 0	3 18 19	*Fixa* c *ad cuspidem* ☽ *inferiorem observata est.*
3 43 45			3 42 20	

Martis

Martis à Luna tecti Obſervationes, *Grenovici* habitæ, *Auguſti* 21. 1676. à *J. Flamſtedio*, in eorum gratiam qui differentiæ Meridianorum inveſtigandæ incumbunt; Editori ab eodem communicatæ.

Auguſti 21. *ante meridiem pro correctione horologii hus limbi Solaris altitudines acceperam:*

Hora horologii.		*Hor. ſupp.*	*Horol. error.*
h. ′ ″	° ′	h. ′ ″	′ ″
8. 04. 31 *alt. limbi* Solis *infer.*	26. 04	8 09 26	+ 4 55
5.42	26. 14	8 10 35	+ 4 53
7.58	26. 34	8 12 53	+ 4 55
9.10 . . .	26.44½	8 14 03	+ 4 53
10.15 . . .	26. 54	8 15 12	+ 4 57
17. 15	27. 54	8 22 09	+ 4 54

Deinde poſt Meridiem, cœlo ſereniſſimo.

Hor. horol.	*Correcta.*		
h. ′ ″	h. ′ ″		′ ″
10.45.03	10.49.58.	Mars *à limbo lucido* Lunæ ——	5125=42.08
11.06.11	11.11.05.	*eadem diſtantia* ——	3829=31.29
20.00	24.55.	*Iterum* ——	3007=24.44
35.57	40.52.	*Denuo* ——	1982=16.18
57.31	12.02.26.	♂ Z. *ſive diff. alt. limb. Inf.* ♂ ——	1912= 7.35
		jamque tubo ped. 16. ♂ *à limbo* ——	1158= 5 47
12.05.00	12.09.55.	*Planeta nudis oculis diutius conſpici non potuit.*	
9.44	14.39.	♂ *lux cum lumine Lunæ confuſa* ♂ Z.	1185= 9.44
10.03	14.58.	♂ *penitus tectus à cuſpide boreo* ——	3475=17 20
18.38	23.33.	41ª. ♂ *in recta per cuſpides ducta apparuit.*	
20 36	25.31.	41ª. ♂ *à limbo vel cuſp. Tubo breviori,*	3912=32.10
24.58	29.53.	41ª. ♂ *à cuſpide iterum eodem tubo* ——	3935=32.21
46.00	50.55.	Lunæ *diameter longiori tubo,* ——	5971=29.47
13.04.30	13.09.25.	*Iterum eodem tubo* ——	5973=29.48
10.56	10.51.	Martis *emerſio forſan* 4″ *vel* 5″ *citius.*	
13.29	18.24.	♂ *à cuſpide boreo* ——	3675=18.20
18.15	23.10.	*eadem diſtantia* ——	4035=20.08
22.00	26.55.	Lunæ *altæ* 23° *Tubo longiori diameter*	5988=29.55
39.00	43.55.	Lunæ *diameter breviori tubo* ——	3645=29.58

41ª. ♂ *ſecundum Tychonem locus nunc eſt* ♂ 17. 58′½ *latitudo* 1°. 20′ *Auſtralis; unde cum Lunæ tum Martis locus accuratè deduci poteſt.* See Fig. IV.

Mr.

Mr. Edmund Hally's *Observations, concerning the same Occultation of* Mars *by the Moon, made at* Oxford, *Anno* 1676. Aug. 21. *P.M.*

Temp. Corr. h. ′ ″		′ ″
11.43.30	*The center of* Mars *from the Neareſt limb of the Moon,*	719½ = 12.40
11.49. 2	*Again,*	571 = 10. 3
11.54.58	*Again,*	409 = 7.12
12. 3.25	*The center of Mars from the North Cuſp of* ☽,	1118 = 19.41
12.10.28	*The gibbous part of Mars touched the Moons limb.*	
12.10.42	*Mars was wholly covered, being diſtant from the Cuſp,*	963 = 17.14
12.40.00	At this time a *Halo* encompaſſed the Moon, in whoſe Circumference was *Saturn*, the *Pleiades*, *Capella*, and the following of the foot of *Perſeus.*	
13.10.41	*Mars did emerge, I ſuppoſe, his Center.*	
13.12.45	*Mars was diſtant from the Northern horn of* ☽,	1018 = 17.55
13.31.10	*Mars paſſed over a point noted in the Teleſcope.*	
13.33.15	*The Southern limb of* Ætna *paſſed by the ſame point.*	
13.34.00	*The lucid limb paſſed over the ſame point.*	
13.52.35	*The Moons diam. obſerved,* 1698 = 30′.1″. *alt.* ☽ 31ᵇ. *circ.*	
13.57.52	*Mars from the Northern horn of the Moon,*	2042 = 36. 5
14. 2.53	*Mars from the Southern horn of the Moon.*	2266 = 40. 3

Having carefully conſidered the Moons Parallaxes in the obſervations of this Occultation at *Dantzick* and *Greenwich*, I find from the *Immerſion* the difference of Meridians between *Greenwich* and *Oxford* 4′.57″; between *Greenwich* and *Dantzick* 1ʰ. 14′. 50″: By the *Emerſion* the firſt of thoſe differences is found 4′. 59″, the latter 1ʰ.14′.41″: which near agreement ſhews the Exactneſs of all the Obſervations.

Two Letters written by Mr. John Beaumont *Junior of* Stony-Eaſton *in* Somerſet-ſhire, *concerning Rock-Plants and their growth.*

SIR, *The Firſt Letter of* April 7. 1676.

I Lately peruſed the greateſt part of the Philoſophical Tranſactions; in which I received ſo great a ſatisfaction, that I reſolved to gratifie your generous Communications (if I may call it a gratuity) with ſome of the neweſt occurrents I have met with in Nature, which, if as kindly accepted, as freely ſent you, I ſhall readily do the like for the future as far as my ability and obſervations will help me out.

What

What I here present you, is concerning *Mineral* substances; for, having liv'd some years on *Mendip-hills* in *Somerset-shire*, and residing at present but a mile on the North-side of them, I have had an opportunity to make some Observations in Mines. I find in several of the *Transactions* a mention made of Minerals, but what I shall here insist on, relates chiefly to what I find *N.*100.*p.*6181; where is a description of certain Stones figur'd like Plants, and by some observing men (as you say) esteem'd to be Plants petrified, communicated by Mr. *Lister*; whose descriptions I shall confirm and inlarge according to my Observations here; being very joyful, that so good a hand has forestall'd a good part of that little news which I might otherwise have sent you concerning these Mineral productions.

1. All the *Trochitæ* and *Entrochi* described with their figures by Mr. *Lister*, are found on those Hills; I having had the several species by me these many years, except that figur'd like a fruit. And as to the length of the *Entrochi*, the thinness and thickness of their joynts, the smoothness of some in their outward circle, the ridges and knots of others, the branches, the degrees of greatness and smallness of the *Trochitæ* and the like, my observations generally concur with his; and so concerning their accidental Injuries. I have that species of *Entrochi*, which is tapering at both ends, and swells in the middle, and I find even the joynts of some are of that make; so that an *Entrochos* shews like a parcel of little barrels, set one on the other. I have likewise his *Summitates* or *fastigia*, being long and slender pieces with a little button on the top; but more of these in their due place.

2. As to their *Hollows*, I find them of all bigness, from a central point to the taking up of more than a third part of the Stone; some of the *Entrochi* are so hollow, that there is only a thin shell left, smooth within and without: Others have only a thin shell left, but with screws within and without; and sometimes both these are one entire piece with seeming sutures. The *hollows* are generally round according to Mr. *Lister*'s description; though I have also many single joynts and *Entrochi*, whose hollows are like a cinquefoil; and though this bore be most surprizing (as he says) yet, methinks, 'tis most natural to the *radix*, which has five hollow stirts or feet issuing side-ways from it according to the figure: And I find in some pieces of *radix's*, which

which I have by me, that a little furrow passes inwardly from each foot to the top of the stone, with a ridge on the outside of it. Besides these I have a new species of *Trochites* and *Entrochi*, which has six inlets in the hollow, as the latter has but five; but with this difference, that these Inlets terminate in Angles, so that its a sexangular hollow, whereas the cinquefoil-inlets are round as the leaf is, and not pointed, though I have seen even of these with sharp angles.

3. Concerning the *Rays*, or ridges, and furrows; the joynts and sockets by which the *Entrochi* are joyn'd together, I find a great variety in them; for, as several rays, shooting from a center, must of necessity leave considerable wideneſſes betwixt them, as they pass towards the circumference, according to the bigness thereof; so, to fill up those wideneſſes, I find, that in some, betwixt two rays, issuing from the center, a third ray rises about half way on the stone from the center, and shoots to the circumference; some have their rays gently widening from the center to the circumference: Some have a trunk rising from the cente, which grows forked towards the circumference: sometimes betwixt those forks there rises a little ray near the trunk where the forks joyn, which shoots to the circumference; (but note, that these differences are scarce discernable where the rays are fine, but with the help of a Glass;) some again are ramous, having a trunk rising from the center, with three, four, or five branches shooting to the circumference: Some are smooth half way on the stone from the centre, and have a circle of small rays near the circumference: Some are smooth without any rays; these are commonly pretty thick, and are joyned in an *Entrochos* after this manner: one *Trochite* a little within the outward circle in the upper and lower parts where the rays use to be, has round inlets or sockets, pretty deep, so that only a thin *Tympanum* hinders, but the *Trochite* would be hollow at this wideneſs all through; and in the middle of this *Tympanum* there is a hole, as in other *Trochites*, which is sometimes round, some times like a cinquefoil: The *Trochites*, that answer this, on both sides have smooth joynts (I cannot properly call them *screws*, having no ridges) which enter into these sockets; those joynts being hollow also, and so other *Trochites* with sockets come on upon those again to make up the *Entrochos*. Some of these have both sockets and rays; some have a socket on the

one

one ſide, and rays on the other without a ſocket; ſome are all ſmooth, only a ſmall ridge runs round them a little within the outward circle, which enters into a ſmall furrow anſwering to it; ſome are all ſmooth, and joyn'd only *per harmoniam*, as Mr. *Liſter* calls it; ſome *Trochites* hold of an equal thickneſs of ſubſtance from the center to the circumference; ſome are pretty thick in the circumference, and grow thinner towards the center; ſo that they have concavities on both ſides, to which convexities in other *Trochites* anſwer: Some hold of an equal thickneſs half way on the ſtone from the outward circle, and then grow concave to the center. Mr. *Liſter* mentions one *Trochite* he found of an oval figure, the rays ſcarce apparent, and a very ſmall point in the place of the pith: I have of this ſpecies with *Entrochi* of the ſame (if theſe, having loſt the figure, may retain the name of τροχος;) ſome of theſe have good large holes in the middle, like other *Trochites*; but their bore is oval according to the ſtone. I have many other *Trochites* of this kind, but with this difference, that theſe have no rays, but are joyn'd together only by one ridge which paſſes directly along the middle of the ſtone the long way, there being a furrow in the other anſwering to it; theſe have alſo a ſmall peck in the middle making but very little impreſſion in the ſtone, and ſeldom paſſing through it, though I have of this ſort with indifferent holes as the other *Trochites*, but ſuch are commonly pointed at the ends, and not carried out with an oval round as the others. There are ſome ſingle joynts which are ſhap'd with a double oval, that is, the oval in the upper part of them ſtands clean contrary to the oval in their lower part: In ſome again the ovals do not ſtand ſo extreamly oppoſite to each other, but only the oval in the upper part of the *Trochite* ſeems a little wreſted from the direct line of the oval in the lower part, ſo that they ſtand bend-ways to each other, like a St. *Andrews Croſs*; and there are *Entrochi* made up after this manner; and I find moſt of the oval *Entrochi* grow crooked and twiſting. There are of theſe oval kinds of all degrees of thickneſs and thinneſs in their joynts, as are found in the round ones, and ſo for the bigneſs of their circumference, their ſmoothneſs in their outward circle, and their roughneſs with ridges, knots and branches, the length of the *Entrochi*, their Injuries, &c.

4. I come now to the *Radix*'s, of which I have one as perfect

as moſt that are to be got, and ſeveral broken pieces of others. That which is perfect, is about the bigneſs of a Wallnut, anſwering to Mr. *Liſters*, but without any impreſſion of a *Trochite* on it; the top of it indeed is a little flat with a hole in it, but it is withal very ſmooth, without the leaſt ſign of a ray. *Agricola* compares theſe ſtones to a Wheel; and truly the body of it well reſembles the Nave of a Cart or Coach, the ſhape of it being conical towards one end till you come juſt to the top, where it is a little flat (as I ſaid) with a hole in it; and it has another hole in the middle of the broad end juſt oppoſite to this, very fit for an *Axis* to paſs through; and the five hollow ſtirts or feet, iſſuing ſide-ways at equal diſtances from the broad bottom, ſomewhat reſemble Spokes; the ſaid ſtirts ſtanding about half an inch out from the body of the ſtone, ſo that it may not very improperly be call'd *Modiolus quinque-radiatus*; and at the ends of the ſtirts, where the hollows ſhould ſhew themſelves, there grows after a very artificial manner a pretty large ſeam of the ſame ſtone juſt over the middle of the hollow, from the upper part of the ſtirt to the lower part of it, parting the hollow in the middle, and covering about a third part of it; not that this ſeam enters farther into the hollow than the mouth of it; ſo that the hollow of each ſtirt preſents it ſelf with two eyes: Hence it appears, that thoſe ſtirts or feet were never longer than they are, and that no ſtone ever grew to them; and I think it hard to get one of theſe ſtones ſo perfect as that I have, it being very difficult for a Miner to ſave theſe fore-ſeams, they being very obnoxious to the leaſt injury. Mr. *Liſter* ſays, the feet were like Creſcents at the end, whereby I find the fore-ſeams of his Stones were broken off, as two of them are in mine. The ſtone ſeems wrought all over like the Fiſh mentioned by Mr. *Liſter*, being compos'd of Trigonal, Tetragonal, Pentagonal and Hexagonal Plates. The upper part of the Conical end is wrought round with ſix large Hexagonal plates, and theſe reach half way the ſtone; then follows a ſecond round, made up of eleven Pentagonal plates, pretty large, and theſe reach almoſt to the broad bottom, which is a little convex; the bottom it ſelf and feet contain Plates of all makes, but moſt of them are very ſmall. This Stone is in ſubſtance a whitiſh opaque fluor, of the ſame nature with the *Trochites*; it has outwardly a ruſty coat, and is blewiſh within like ſome Sea-ſhells. When 'twas firſt found 'twas full of a ſort of

aſhcolour'd

aſhcolour'd-griſty Clay, which is the evident mat erial cauſe of it, it being found in a bed of the ſame. I eaſily pickt out the Clay with a Needle, ſo that 'tis now all hollow; the ſhell-like and ſparry ſubſtance being ſcarce as thick as a Half-crown. I muſt own the knowledge of its being a *radix* to Mr. *Liſter*'s hint, though I have *Agricola* by me, but did not well mind him; and becauſe the perfect *radix* was ſmooth on the top, and many other pieces of *radix*'s which I have by me, they did not well indicate the thing, though upon a review I find one of them with ſmall rays there. I have a great many of the Tetragonal, Pentagonal and Hexagonal Plates, with concavities, convexities; thin, ſmooth, and indented edges; little round knots on the convex part, others being only ſcabrous, others ſmooth, as I find many large pieces of the *Radix*'s are. The ſides of ſome are very unequal; in ſhort, they agree in all things with Mr. *Liſter*'s deſcriptions. I have one ſexangular Plate very pretty, whoſe convex part has on it a ſtar conſiſting of ſix Emboſt rays, which ſhoot from the center directly to the middle part of the ſides betwixt the Angles, and betwixt every two rays there grows a little ſtud after a very elegant manner.

5. To give an account of the *place* of their birth (though hinted before) I may now ſay this; I find the *Trochites* ſticking to rake-mold ſtones, and in the crannies of Rocks at all depths, from the graſs to 20 fathom; and doubtleſs there are of them deeper: But I find them moſt plenteouſly in certain beds of an aſhcolour'd-griſty Clay, and particularly at one place within a yard or two of the graſs. I found here a fruit with them like a *lapis Judaicus* (though ſomewhat defac'd) if not a ſpecies thereof; its about the bigneſs of an Acorn, with ridges and furrows running the long way; it differs from thoſe deſcrib'd by Mr. *Liſter* N. 110; *firſt*, that this is not bigger, but rather leſs in the middle than at the ends; and *ſecondly*, that its ridges are not knotted or purl'd. It is in ſubſtance a whitiſh opaque ſpar like the *Trochites*, though (as Mr. *Liſter* ſays) ſome *Trochites* are of a dark-colour'd ſpar; and I find ſome of a white cawky ſubſtance, and ſome have a tincture of red; but theſe differences proceed from the Clay of which they are made; for, though an aſhcolour be the chief in it, yet there are ſome veins of red in it, ſome of white, ſome of a light-blew, ſome of a dark-blew &c; which cauſe theſe varieties in the ſtones. I find ſome *Trochites* and *En-*

trochi ſhap'd in raw Clay before they have attain'd the conſiſtency of a Stone; and theſe, if laid in the Sun, become light and ſpungy like a *pumex*. I took up there a piece of another ſtrange Stone, of the like ſparry ſubſtance; 'tis about the bigneſs of a Wallnut, hollow, and fill'd with the ſaid Clay; it ſomewhat reſembles a Helmet; the fore-part of it is ſmooth, the upper part, which has a large ridge in the middle, is all wrought with little rings, three at a place, encircled within each other. The Stone call'd *Cornu Ammonis*, ſhap'd like a Rams-horn, is very frequent in this clay; the largeſt I have is ſeven inches in length, four inches in compaſs at the broad end, and two and a half at the ſmall end; the top being broken off. Tracing its Original, I find ſome of the firſt buddings out of it about the bigneſs of a young Cocks-ſpur, and very much like it. I have ſome in raw clay, and one growing from a white Cawky-ſtone. They generally become at laſt a whitiſh Spar, and ſome milk-white as ſome of the *Trochites* are: There are of all intermediate proportions betwixt theſe two, though very few of any bigneſs are to be found entire, but all broken and imperfect pieces: And I take the ſeeming *ſummitates* of Mr. *Liſter* to be only little eſſays of Nature towards the production of this Stone, the alliance being evidently nearer than betwixt them and the *Trochites*. The texture of theſe Stones is thus: Some have maſſy ſpar in their inſides, which takes up three parts of the Stone; then from the ſharp top there grow thin flat cells, or ſmall pipes of Spar, ſet edge-ways, one cloſe to the other, all round the Stone, which ſhoot towards the broad end, and appear outwardly like ſmall ridges or ſeams; and many of theſe pipes, running down thus after the ſtone, ſhew their hollows, ſome at one place of it, ſome at another, and ſome not till they come to the broad end: And this is the texture of the great Stone, which has rings alſo, though ſomewhat defac'd, running round it, tending likewiſe in their growth towards the broad end as in a Rams-horn. Moſt of the leſſer ſtones have very little maſſy ſpar within them, and ſome have none, but appear ſomewhat hollow at the broad end, with cells coming down inwardly from the top of the ſtone, reſembling thoſe in the flowers of Coral, which terminate its branches; and doubtleſs, if taken from their beds in a ſeaſonable time, would yield the like milky-juyce; for I find in the Cells of ſome broken pieces of theſe ſtones an evident concretion of ſuch a

milky

milky juyce. And I may here acquaint you, that I have a piece of branchy ſpar, which I found at a Mine on theſe Hills, growing like Coral, and terminated with buttons or flowers like it. I find very few of the leſſer *Cornua Ammonis*, whoſe Cells do any way appear or ſhew their hollows outwardly, as in the great ſtone, whoſe outward ſurface is wholly made up (as I ſaid) of thoſe cells, or thin flat pipes, ſet cloſe the one to the other, many of which ſhew their hollows at ſeveral places in the ſtone; whereas the cells in the ſmaller ones appear only inwardly, having one coat outwardly which covers them all, and this coat in ſome is ſmooth, in others it's all wrought with little rings like the Helmet-ſtone beforemention'd; and ſome outſides have ridges or rings round them as a Rams-horn.

6. The Stones, I have given you an account of, generally move in Vinegar, the juyce of Lemmons, &c. ſending forth bubbles, as I find Cawk will very freely, and moſt of our Mineral ſtones. *Baptiſta Porta* tells us, l. 20. *Magiæ Naturalis*, that he ſaw a piece of *Alabaſter* weighing four pounds, and carved in the ſhape of a Tortoiſe, move ſo. The ſaid motion ſeems to proceed from the conteſt betwixt the acid ſpirit of the Vinegar and the Mineral ſalt; ſo that the Spirits by fermentation breaking forth under the Stone produce that effect.

I well know, that an accurate view would diſcover many nice diſtinctions (omitted by me) in the ſhapes of all theſe Stones, (our Mineral Salts being almoſt as buſie and luxuriant, as the volatile Salts in the Air in the figuration of Snow;) which I judge would be beſt perform'd by that perſon who makes it his buſineſs to record theſe things in the Hiſtory of Nature, he being the moſt likely to find the apteſt terms to ſpecifie them; and haply the beſt ſervice we can afford you from the Country, may be to furniſh you with the things themſelves, with a diligent account of the ſoyl and place of their birth, and with as full an intimation of their primary riſe as we can poſſibly arrive at by a cloſe inſpection; leaving the minute deſcription of the thing to the worthy Hiſtorian.

Should I give you my thoughts concerning their *Vegetation*, it would lead me beyond the bounds which I am willing to allow this Letter, though I ſhall readily do it, and what other ſervice I may, if you pleaſe to command it. If I had had the conveniency of an Artiſt to help the failings of my pen with his deſign,

ſign, haply theſe things might have been more acceptable to you, and to thoſe other worthy Perſons, who make it a part of their delight to behold theſe curious ſports of Nature, as they are repreſented by a skilful hand, when they cannot ſee them in themſelves; but I know your Candour will excuſe what could not be procur'd by him, that is very much, *Sir*,

Stony-Eaſton, Apr. 7. 1676. *Your humble Servant*, J. Beaumont *Jun.*

SIR, *The Second Letter of* June 17. 1676.

SInce my laſt having uſed ſome diligence in ſearching Mines, it has been my chance to make good the ſuſpicion of Mr. *Liſter*, to wit, that the *Trochites* are parts of Rock plants; for, viewing the Earths and Stones caſt up out of ſeveral Mines where thoſe ſtones were, I came at length to a Mine, where well near all the *Entrochi* (ſo called hitherto) or bodies of theſe plants grew tapering and ramous, ſome of them having branches iſſuing from them near two inches in length, and other ſmall branches iſſuing from thoſe; and upon a nearer ſearch I diſcover'd an Entire plant, though ſmall, growing up after the ſide of a Stone: I found alſo, that all the clifts in ſome Mines are made up of theſe Stone-plants; whereof ſome, as appears, were converted into the nature of thoſe Lime-ſtone-rocks, whilſt they were in their firſt tender growth; others being become *Spar* compoſe rocks of that ſubſtance.

Conſidering that all the Clifts for a very large circumference in ſome places are made up of theſe Plants, we may truly ſay, that there have been, and are, whole fields or forreſts of theſe in the Earth, as there are of Coral in the *Red-Sea*. In the Courſes, (or Loads, as ſome call them) betwixt the clifts I find of theſe Plants growing up in the griſty clay, mention'd in my laſt, being rooted on the rake-mold ſtones; many of them being above a foot in height, and about the bigneſs of the ſtem of a Tobacco-pipe: All I have yet ſeen of this length, are either raw clay, or of the conſiſtency of a Lime-ſtone, and ſome of them have outwardly evident beginnings of circles and ſutures. The ſmall Plant which is entire, and the branched bodies of many others have attain'd their full term of growth, being become perfect *Spar*: If theſe had ever a height anſwerable to their bigneſs, (ſome of them being near three inches about, they muſt have been much higher than thoſe before-mention'd: The branches are all joynted,

ed, and have the ſame bore with the trunks, and are terminated with round and blunt joynts, but very ſmall. I find the bores or hollows of ſuch as are found to be commonly fill'd with a milky crudeled ſubſtance, which probably in their time of growth was fluid like that in Coral. As it cannot be doubted but many of theſe Plants grow on thoſe admirable *radix*'s of which we have given an account, and whereof I have at preſent ſome pieces which have a cinquefoil-bore on the top, others with the impreſſions of oval joynts there, and many other differences; ſo I am now fully ſatisfied that many of them grow from plain roots, that is, from plain *Spar*, or *Limeſtone*, without any ſuch figure, as the entire Plant does, and many other trunks which I have noted.

Another obſervable is, that theſe plants do not alwaies grow up with one trunk or body, but ſometimes five or ſix ſprouts, near of an equal bigneſs, ſhoot up together from the ſame root; as it uſually happens with Coral. As in my laſt I acquainted you, that I had ſome ſingle joynts and pieces of many joynts, which had ſix inlets in their hollows; ſo I have ſince met with ſome which have only four, others with ſeven, and doubtleſs there are of other varieties in this kind. Mr. *Liſter* is pretty full in his account concerning their outward differences; to which I may add, that ſome trunks have a circular edge on every other joynt; the intermittent joynt being ſmooth without edge or knot: Some Trunks have circular edges on the middle of every joynt, but ſo that the firſt and fifth edges are the higheſt; the ſecond and fourth the loweſt; the third is higher than the latter, and lower than the former; the joynts themſelves being great and ſmall accordingly, and this order holds all along the Plant. Some Trunks have edges according to the ſame order, only the edges on the ſecond and fourth joynts are round and blunt, the other three being ſharp; ſome have edges after the ſame order, which are all round and blunt. There are ſome Trunks wrought after the ſame manner, only the firſt and fifth joynts have a circle of knots round them, the other three have edges: Some Trunks have no circles, nor knots, but are only a little ſcabrous like the plates which compoſe ſome Roots, of which Plates I have alſo now ſome of different figures from what has been obſerv'd hitherto. It may be a *Quære*, whether theſe differences in the bores and outward coats of theſe plants do argue them to be

of

of different ſpecies, diverſity of figure being uſually a mark of a ſpecifical diſtinction; but ſince the texture of their ſubſtance appears to be wholly the ſame, and we find no qualities either by the ſmell or taſte which manifeſt any ſuch diverſity, it may, perhaps, be as hard to make them out to be diſtinct ſpecies, as to ſhew a ſpecifical difference betwixt ſeveral Snow-bloſſoms.

Conſidering the reaſon of that ſtrange and mangled diſorder which theſe plants uſually lie in, ſome of them appearing to have been depreſt in their infant growth, others to have been broken after they were come to their full conſiſtency, &c. I gather it to be this: Whilſt theſe plants were growing, the clay wherein they grew was ſoft as a Quag mire, theſe probably requiring ſuch a ſubſtance to ſupport their growth, as Coral does Sea-water: afterwards as they began to ſettle to a Stony conſiſtency, and as part of the clay became of a rocky nature, the whole maſs ſank from its firſt poſition, and the moiſture paſſing away made ſome concavities, waſhing down ſome broken pieces of thoſe ſtones with it; and lumps of clay and other ſtones, falling down through thoſe crannies, added to their confuſion, being very apt to be diſordered by the leaſt concuſſion, either whilſt they were in their firſt growth, or after they were become Spar, their joynts being very tenderly ſet together; and hence theſe Stones are generally found in *Leirey* places (as they call it) that is, *Cavernous*.

The beſt way to explicate their *Vegetation* will be, *firſt*, to repreſent the ſeveral ways of the growth of *Spar*, which (to paſs by the account from *Helvetia*, that Snow by long lying and continual froſts is hardned into Spar) I obſerve to be three: *Either* it takes a being from Steams alone; or from Steams coagulating either Dew as it falls on the ground, or Waters iſſuing from the joynts of Rocks underground; *or* it grows from Earths and Clays. We have an Inſtance of the *firſt* in many Grotto's, where ſome Spars, produc'd from Steams alone, hang from the roofs like Icicles; Lead-oar often growing in the ſame manner; and as this Spar grows downwards, ſo in many places from the ſides of it, there iſſue little Plants of Spar, which ſhoot upwards contrary to the growth of the other: Thus Spars grow from ſteams about the Baths at *Buda* in *Hungary*, according to the relation of Dr. *Browne*. An example of the *ſecond* is given in the *Tranſact. N.* 83. *p.* 4068. where 'tis ſaid, that at a certain place in

Italy

Italy Cryſtals (which are a ſort of Spars) are produc'd in clear evenings by a coagulation of Dew falling on Nitrous ſteams. We have ſome of the like riſe on *Mendip-hills*, our Miners finding ſometimes in roads, where the earth is bare, triangular Cryſtals about two inches in length, and an inch over, not with ſharp angles, like the Triangular glaſs, but with round and blunt angles, and carried up round at the ends like a Coco-nut, none of theſe being ever found in digging: I have ſeen of the ſame ſort which were taken up in *Gloceſter-ſhire*. So again its commonly ſeen in Grotto's, that ſteams, coagulating waters iſſuing from the joynts of the clifts, produce Spars of all colours. As to their *third* way of generation, to wit from Earths and Clays, becauſe I do not remember to have met in any Author with a ſatisfactory account thereof, I ſhall briefly relate to you what I have obſerv'd herein.

There are on *Mendip-hills*, and generally where Mines are, ſubterraneous Vaults or Grotto's, whereof *ſome*, which are pretty deep, and admit not air too freely, and have other conditions requir'd, are ſaid by our Miners to be quick, having often oar in them, and ſtill lively colour'd Earths, with ſome moiſture and lively Spars: *Others*, admitting air two or three ways, and having in them black and moiſt rocks, and dry and rotten ſhelly Stones, dark Earths, barren Sands, and the like, being ſaid to be dead. I have often ſearch'd both, and in ſome of the former, particu'arly in one of them, which is 35 fathom deep by a perpendicular Line (though the oblique deſcent of it makes it above 50 fathoms to thoſe that go into it,) I diſcover'd this proceſs of nature in the formation of Spar: There are in the bottom of this Grotto ſome beds of Clay, and others of a Liver-colour'd earth, which I take to be as good a *Bole* as any now in uſe; it is inſipid to the taſte, but ſmells well, eſpecially when dry'd; for, as it lies, it is moiſt and like paſte, made ſo partly by the diſtilling waters, and partly by a ſteam incumbent on the place raiſed from thoſe waters by the Mineral ferments. This Earth and Clay there ſhoots up every where in ſpires in all proportions in height, from the firſt buddings out of it, till it comes almoſt as high as a mans finger; the biggeſt of them being in thickneſs about an inch diameter: Theſe ſpires are all rul'd up with irregular ridges and furrows, and ſome ſooner, ſome later begin on the top to be congeal'd into Spar, and ſo, gathering a cruſt down-

ward by degrees, are all at last turn'd into an absolute white Spar, with some *Diaphaneity*. I discover'd the same Earth in some places there growing spherical, which whilst it is Earth, it is still sticking to its bed; but afterwards, as it comes to be crusted over, and at last to be turn'd into Spar like the other, it grows clear off from its root, as fruit falls from the tree when ripe. I have by me of these Spherical stones, from the bigness of an ordinary Bullet to that of a great Pins-head, some turning to Spar sooner than others: I found some quite grown off, some half grown, some white Spar outwardly, and raw Earth in the middle, so that the process was as plain to me as I could wish. I saw the same Earth in some places there growing in an exact oval form, and turning into Spar not oval, but rais'd on both sides with an edge round it like an Apricock-stone: And as these spherical and oval stones are most exact in their figure; so, notwithstanding the Rector fails in this Vault to give a true sexangular figure to those which I said shoot up pyramidally; yet there is a certain place on these hills, where the Spars grow all sexangular, both points of them terminating into a pyramidal figure, sexangular likewise, as the veins of Crystal, found in *Italy*, produc'd by a coagulation of Dew; these with us probably having the same rise, lying also on the surface of the earth. Here I may acquaint you, that I find *Talc* on these Hills growing sexangular; the rust, which often lies over veins of Lead-oar, in many places shoots up pyramidally, and is bounded round with six angles, and sometimes with five: Lead-oar it self often shoots up pyramidally with rough irregular lines round it, and in some places I find it bounded round very regularly with four angles; in other places it grows branched like a Plant, as I have seen in a Mine where the Stone-plants grow.

To come now to the *Vegetation* of these plants, I find, they begin their growth from the finest parts of clay, being commonly white, soft and smooth at first, and by degrees come to have ridges, knots and sutures, as they grow towards a stony, and so to a sparry nature. The pith continues still soft and white, as the whole is at first, and its continually refresht by the Mineral steams, and moisture, which have free access to it through the five hollow stirts or feet in the figur'd roots, or through the mass of clay which commonly lies under the plain roots; this free supply of moisture being probably more necessary for the sup-

port

port of these plants than for those which appear to the day; since Nature carries-on her Mineral generations with a stronger effort than other: Wherefore Field-plants hold a communion with the steams and moisture of the earth by perspiration only, as they breath through the roots, which have no open passage for them. Nor can it be said but those Stone-plants have true life and growth; for since in the curiosity of their make they may contend with the greatest part of the Vegetable kingdom, having parts to assimilate nourishment by attraction, retention, concoction and expulsion, I know not why they may not be allow'd as proper a vegetation as any plant whatsoever. And indeed what has been said hitherto against the vegetation of Stones, to prove that they receive their increase only by *juxta-position*, has been chiefly meant of Common stones, which have no parts that carry any analogy with plants; whereas these are shap'd like them, having inward pith or sap, and likewise joynts, and runnings in their grit, and sometimes cells, which may very well supply the place of veins and fibres. Nor does that argument which is brought in the *Transact. N.* 99. against the vegetation of Coral seem to convince us: For though that Person can produce a Salt of Coral, which after dissolution will upon coagulation shoot into a little grove of Plants, as it were, resembling the growth of Coral, this cannot disprove its Vegetation; for, it's well known, that all Plants may be so prepar'd, that from their ashes they will rise again in their proper species after such a manner.

As to that opinion which generally solves those various *Phænomena* of the several figur'd Stones, which we find in Mines and elsewhere, by saying that they are parts of Plants and Animals, or whole ones, petrified; it seems not to be grounded on practical knowledge: Thus when we find several sorts of *Shell-fish* in Mines, as there are some in the clay where those Stone-plants grow, we must not flie to petrifaction, as though they had been brought there by the Sea, or otherwise, and so petrified; but we must take that to be (as it is truly) the natural place of their birth; some of them being raw-clay, others of the same texture with the Rock where they grow, and others of as absolute a shelly substance as any in the Sea; these being only different gradations of Nature, which can as well produce shells in Mines as in the Sea, there being no want of Saline nor Earth-

thy particles. Nor is there any great difference betwixt some sorts of Spars, and Sea-shells; neither do I know, why Shells might not as well be produc'd in Mines, as any sorts of Spars are in the Sea; for instance, the *Fungi Marini*, which are of a sparry substance, some of them having their surface all wrought with flowers, as it were, which are only the terminations of sparry cells, as in Coral, and Coral it self is a sort of Spar, which so well resembles our Stone-plants in its growth, especially if some of it be joynted, as Mr. *Ray* informs us, that I know not a more apt name for these than to call them *Mineral Coral*; unless some haply will rather say, they are *Fluores arborescentes internodiis distincti*; and as I find the bodies and branches of some Coral are all rul'd up with lines, so are many of these in some Mines, and are terminated with cells like it.

Mr. *Lister* N. 79. of the *Transact.* p. 2282. judges, that Shells found in Stone-quarries were never any part of an Animal; and gives this probable reason for it, because Quarries of different stone yield us quite different species of Shells, not only one from another, but from any thing in Nature besides, which either the land, salt, or fresh water does yield; and though some seem of the same species, and much like each other, yet there is distinction enough to hinder them from being sampled by any. *This Mr.* Lister. I observ'd the same thing some years since, when I endeavour'd to satisfie my self of the process of Nature in this kind; and have now by me several species of Stones resembling *Shell-fish*, which I gather'd from Plow'd-fields and Quarries, that are scarce to be parallel'd, as I judge, by all the Collections of Sea-shells extant.

To examine this opinion of *Petrifaction* further; perhaps it might seem rash to deny a petrifaction of Animals and Vegetables, so many instances being alledg'd on all hands by judicious persons attesting it; though I cannot say, that my own observations have ever yet presented me with an ocular evidence of the thing: I only find, that the thing suppos'd to be petrified becoms first crusted over with a stony concretion, and afterwards, as that rots away inwardly, the lapidescent juyce insinuates it self by degrees into its room, and makes at last a firm stone resembling the thing in shape; which may lead some to believe it really petrified. But, though a real petrifaction were allow'd in some cases, it would not be rational to plead this in all the figur'd

figur'd ſtones we ſee, in regard of thoſe many grounds we have for the contrary. But I take theſe to be the chief reaſons which make ſome ſo ready to embrace ſo generally this conceit of petrifaction, becauſe they are prepoſſeſt with an opinion againſt the vegetation of all Stones, and for that they think it impoſſible for Nature to expreſs the ſhapes of Plants and Animals where the Vegetative life is wanting, this being a faculty peculiarly belonging to that ſoul, whereas they ſeem to erre in both: For, as what has been ſaid concerning our Stone-plants, may ſuffice to prove their vegetation; ſo it will be as eaſie to ſhew, that Nature can and does work the ſhapes of Plants and Animals without the help of a Vegetative ſoul, at leaſt, as it is ſhut up in common ſeeds and organs. To be ſatisfi'd of this, let them view the figurations in *Snow*; let them view thoſe delicate Landskips which are very frequently (at leaſt in this Country) found depicted on ſtones, carrying the reſemblance of whole groves of Trees, Mountains and Vallies, &c; let them deſcend into Coal-mines, where generally with us the clifts near the Coal are all wrought with curious repreſentations of ſeveral ſorts of *herbs*; ſome exactly reſembling *Fern-branches*, and therefore by our Miners call'd the *Fern-branch clift*; ſome reſembling the leaves of *Sorrel*, and ſeveral ſtrange Herbs, which haply the known Vegetable kingdom cannot parallel; and though it could, here can be no colour for a petrifaction, it being only a ſuperficial delineation. The like may be ſaid of Animals, which are often found depicted on Stones; as all Mineral hiſtories will ſufficiently inform them. Now ſince here is no place for Petrifaction, or a Vegetative ſoul, we can only ſay, that here is that ſeminal root (though hindred by the unaptneſs of the place to proceed to give theſe things a principle of life in themſelves) which in the firſt generation of things made all Plants, and, I may ſay, Animals riſe up in their diſtinct ſpecies; God commanding the Earth and Waters to produce both, as ſome Plants and Animals riſe up ſtill in certain places without any common ſeed.

It ſeems to be a thing of a very difficult ſearch, to find what this *Seminal root* is, which is the efficient cauſe of theſe figures. Many of the Ancients thought it to be ſome outward mover which wrought the figures in things for ſome end; the *Peripateticks* rather judg'd it to be ſome vertue implanted in the ſeed, and in ſubſtances having an analogous nature with the ſeed. As

I have now and then essay'd to find the nature of this Efficient, which works these figures in stones: It seem'd to me not very unapt to explicate it according to the saying of *Heraclitus*; *Lux ficca, anima sapientissima*, that is, where there is a strong internal light to expand the Idea's, and a drought to terminate them, the vertue of a soul is still present which imprints them in the matter: Hence we find Nature is most busie in the kind where her intentions are highly raised by the presence of her chief principles, Salts, Sulphurs, and Mercuries promoting her ferments, which cause some internal light and drought, the *Ignes fatui* being only shadowy results from them: Thus we see over and in beds of Clays and Marles, which have strong ferments, being well impregnated with Salts, there often lie beds of Marchasites full of luminous particles, and there we frequently find great numbers of *Lapides Serpentarii*, and Marchasites resembling Snakes; and so several other figur'd Stones, as the *Belemnites*, &c. In the joynts of the Lias-stones, growing over beds of Clay, we often meet with a great plenty of elegant Landskips. In Coal-mines, where the Sulphurs are strong, we find great lumps of very bright Marchasites, and great varieties of Herbs depicted, as is said before. In Mines of Metals, where the Mercuries are generally predominant, there are landskips and representations both of Land and Sea-animals, whereof some carry a bulk, others are only superficially delineated. Those who endeavour to explicate those figurations mechanically, seem to have a harder task; for, if they say with *Hippocrates*, l. *de Nat. Pueri*; *Spiritu distenta omnia pro generis affinitate distant*; as though, when the Mineral spirit had extended the matter, it fell into those figures upon a spontaneous recess according to its proper weight, which gives order and measure to things; as he mechanically shews by a Bladder, into which if earth, sand, and filings of lead be put, and water be added to them, and we give them motion by blowing in the Bladder through a reed, first they are mixt together with the water, but in a while continuing in a gentle motion they separate themselves and retire each to its like, the lead to the lead &c; I say, if it be explicated thus, it seems difficult to conceive, how the matter should come to have such a determinate weight to run into such figures, without a specifical *Rector* to intend and dispose it, unless a general one be admitted, in whose vertue all known and possible species are, which, first introducing

troducing diſpoſitions in the matter, he intentionally works; and, as ſometimes he gives that weight to the matter, not endowing it with a principle of life, ſo he often diſpoſes it to receive life and introduces it: which Poſition I conceive will hold good, notwithſtanding ſome late induſtrious eſſays to prove that there is no Equivocal birth.

Thus, *Sir*, I have inform'd you, that the *Trochites* are parts of Rock-plants, and have given you ſomething of what I conceive and practically know concerning their vegetation, eſſaying withal to render ſome account of thoſe various figures which are found amongſt Minerals: Not but my thoughts are very poor of theſe things, which can make but a very ſlender addition to that rich ſtore ſent you by your learned Correſpondents. I ſhall conclude with a requeſt to you concerning a thing, which may prove very much to the advantage of thoſe who are concern'd in Mineral adventures: It is a conſtant opinion amongſt our Miners, that *Lead-oar* diſcovers it ſelf by an Oily-ſmell, and that chiefly in a morning a little before the riſing of the Sun, eſpecially when ſome ſhow'rs have fall'n in the night: This being ſo, I find two things in the *Tranſact.* which give me hopes that this way of diſcovery may be much improv'd by Art: The *firſt* is an intimation of a way ſhewn by Sr. *William Petty* in his Tract of *Double proportions*, whereby we may diſcover a ſmell at a great diſtance, and ſo conſequently the intenſneſs and remiſneſs of it near at hand, wherein the chief difficulty will conſiſt; for, where theſe Smells riſe, they commonly diffuſe themſelves to a furlongs circumference or more, ſo that we are more at a loſs to find exactly the place whence they riſe, than to make a firſt diſcovery of them. The ſecond thing is the *Statical Baroſcope* of Mr. *Boyle*, which I conceive may give us ſome light of their true ſource, there being probably at that place a conſiderable variation in the preſſure of the Atmoſphere by reaſon of the Mineral-ſteams which are there in the greateſt abundance. I am not ignorant, that ſome ſtrongly fermented beds of Mineral-earths and ruſts, which are ſometimes barren, ſend forth a ranker ſmell than Oar it ſelf, which may now and then deceive us; but becauſe for the moſt part theſe are concomitants of Oar, we may not look upon the attempt as fruitleſs. Now, *Sir*, my humble requeſt to you is, that you will be pleaſed to oblige me with your opinion of the probability of the ſucceſs, and to inſtruct me in the way which Sr.

William

William Petty propoſes in his *Double proportions*; for I have not read the Tract; and if I underſtand you judge the thing rational, I ſhall endeavour to procure the Inſtruments, and proceed to practice, and ſhall pay you my hearty thanks with a ready return of any ſervice that lies in me, being, *Sir*,

Stony-Eaſton, June 17. 1676. *Your obliged and humble Servant*, J. Beaumont *Jun.*

An Account of ſome Books:

I. *Ephemeridum Medico phyſicarum Germanicarum ANNUS* IV & V, *Anni* 1673 & 1674, *&c. Cum Appendice*: Francofurti & Lipſiæ, 1676. *in quarto.*

THis induſtrious Collection contains 210 Obſervations; among which not a few ſeem conſiderable and uncommon; *E.g. Menſes* coming at 8 and 9 years of age: A Prince that lived a great while with great and dangerous diſeaſes: The Errors of Nature in one part, ſupplied by another: A preſervation from drunkenneſs by the gaping of a Suture of the Head: A cure of the Scurvy by a Dog's licking the Patient in the parts moſt affected, together with the cure of that Dog, becoming altogether ſcabby, by *Mercurius dulcis*: Two men monthly troubled with the Hæmorrhoids, from their youth, the one unto the eightieth, the other to the ninetieth year of his age: An Ague recurring every eighth day: Worms of divers ſorts fallen down with Snow in *Hungary*, not far from the Copper-mines of that Country: Of a young woman, that though ſhe did for a while drink wine, yet came afterwards ſo to abhor it, that ſhe could take nothing phyſical, that had any thing prepared of Tartar in it, but did ſweat, and faint away when it was given her, though ſhe knew nothing of it before hand: The juyce of Hemlock mixed only with a little Sugar, for ſeveral days taken inwardly, to the quantity of three ounces at a time, to allay the heat of the Liver; follow'd by no other noxious effect but a debilitation of the ſtrength of the Patient: The Preparation of the Helmontian *ludus*, together with an account, that the Oil, drawn of black Flints, ſuch as we ſtrike fire with, cures the Stone of the Bladder; as alſo, that the Spirit of Sea-ſalt, eſpecially of *Spaniſh*-ſalt, is a potent remedy againſt the Strangury: A wound in the Breaſt and Lungs not mortal: Fontinels or Iſſues naturally ariſing in the Arms and Feet, and curing a Patient of a violent Headache, and troubleſom puſtules of the Head; as alſo of an Iſſue in the

the *abdomen*, curing a woman of her Hydropical distemper: Two persons preserved alive after they had drunk (unawares) a good quantity of *Aqua fortis*: Several men cured of the Gout by a decoction of *Trifolium palustre*, (Marsh-trefoil or Buck-beans:) Many Stones voided by siege: Fomentations made with the decoction of Emmets, very anti-paralytical: Cinamon-trees, sent out of *Ceylon* in Chests, filled with the native Earth of that Island, transmitted into the Low Countries, and there thriving very well, without any considerable change of their quality: A Girle of eight years old, greedily eating Mortar great store, without any other harm than paleness of her looks: A Man at *Prage*, from his all-devouring quality called πάμφαγος, devouring a whole live Hog by piece-meal, with the bristles on: Of some Men of unusual strength; as, of a Prince of *Bavaria*, that could lift up from the ground a stone of three hundred and forty pound weight, and throw it from him to a considerable distance: Of a Man, that upon an Apoplexy had quite forgot all reading, and knew never a letter, yet was able readily to write any of the Languages by him known before, though unable to tell any of the letters thus written by himself: *Quære*; Whether this case might not be like that of those that can write with their Eyes shut; the phancy working in the act of writing, but the memory failing in knowing and distinguishing the letters: Of a young Man, whose Hands, and those only, at certain times, smelt of Brimstone, without any contact of Brimstone: Of the Spleen cut out of a man alive, the Patient surviving his Spleen for many years: Of many Horses breeding the Stone, as well as Men, and of the Bezoar-like virtue of such stones: Of the Juyce of Vines frozen, and that Ice representing the figures of Vine-leaves and Grapes: An Anatome of a Tortoise, shewing, that what the ribs are in other Animals, the upper-shell is in Tortoises, and that to that upper shell are firmly fastned the spinal vertebra's; so that this Animal cannot go out of its house, as Snails do: Of a Statue, resembling a Man, and representing the Circulation of the Blood, &c.

To these Observations is added an Account of the Life, Studies, Writings, Correspondence, and Death of the Learned Dr. *Sachsius*. To which is subjoyn'd an Appendix, taking

notice of several Tracts published by divers Philosophers and Physicians of *Germany*; *viz.* The three Centuries of the Medicinal Miscellanies of Dr. *Velschius:* The History of Dr. *Elsholtius* of a *Steoma* successfully cut and cured, together with his Epistle of a Conception in the *Tuba Uteri:* Some observations of Dr. *Balduin*; concerning 1. the Regermination of Silver, by a new artifice; 2. the Urns of the pagan *Germans.* 3. a Factitious stone, shining in the dark, after it hath been a while expos'd to the Sun, as the natural *Bolonian* stone is said to do, though that artificial one is affirmed to do it in a more excellent manner, forasmuch as, when after the imbibition of the Solar light it is cast into a glass-full of Spirit of Niter, it doth notwithstanding shine in the dark; and that more is, when 'tis taken out of the said liquor, and dried again in the dark to make it lose its light, and then put again into a glass-full of cold water, and exposed to the day-light, it will for all this resume a splendent brightness even in the cold water it self: Again, being again taken out of the cold water and dried, and deprived of its light in the dark, and then put into a hot oven, it will there recover its light, though the room be dark. There is further mention'd and described in this work Dr. *Mentzelius* his Tract, comparing this Shining stone of D. *Balduin* with that of *Bolonia*; as also, Dr. *Wedelius*'s Experiments about the Extraction of the Volatil Salt of Tartar; long since performed here by Dr. *Daniel Cox*, whom he also cites for it: Likewise, an Epistle of Dr. *Reisselius* to the *German* Academists about some *Desiderata* in Physick, hitherto not much considered, or cared for; where mention is made of an *Historia Medica*, expected from Dr. *Schæferus.* Lastly, an Account given by Dr. *Bernitz*, the King of *Polands* chief Physician, concerning some Anti-podagrical remedies, made use of in the cure of *Uladislaus* IV. King of that Country; where, occasionally, the Herb is named and described, wherewith the Eastern Nations tinge not only the Mains and Tails of their Horses, but also some parts of their own body.

II. *Nouvelle*

II. *Nouvelle Methode en Geometrie pour les Sections des Superficies Coniques & Cylindriques; qui ont pour Baſe des Cercles, ou des Paraboles, des Ellipſes, & des Hyperboles; Par* Ph. de la Hire, *Pariſien. A* Paris, 1673. in quarto.

THis Author, (who came but very lately to my hands) informs his Reader, in his *Preface*, that he would not have publiſht this Book, if he had not been perſwaded, that the ſimplicity and plainneſs of the New Optical or Projective Method, by him found out, after the *brouillon project* or rough-draught of M. *Des Argues*, would be of great uſe to the ſtudious of this ſubject, and if he had not been aware, that no Writer had as yet taken this way by him inſiſted on. For, he ſaith, that in his firſt Propoſition he demonſtrates all the proportions of the Lines, which coming from one point, or being parallel among themſelves, and meeting the Sections, are cut by theſe Sections, or by the lines that joyn the contacts, or by other Tangents: which he affirms doth comprehend a great part of the Propoſitions of *Apollonius*; and many others alſo of which he hath not ſpoken: Which ſeems to him very eaſie to underſtand, foraſmuch as it is nothing elſe but a continual repetition of the application of one only line cut in three parts, which Line he calls cut *harmonically*; not that the parts taken ſeparately are in harmonical proportion, but that, by taking one of the extreams for one, and the ſame with that of the middle for another, and the whole for the laſt, theſe three lines ſhall be in harmonical proportion.

After he had diſpatched this Propoſition, he ſaith, that he was reſolved to have concluded his Book with the Power, Relation, or Habitudes of the *Ordinates* by comparing them to the Rectangles of the parts of their diameters; but that he found himſelf inſenſibly engaged to add to it ſome other Propoſitions of a more uſeful kind, and which might eaſily be demonſtrated by the Firſt; and then, the Propoſitions of the Ancients about the *foci* or *puncta comparationis*; and the demonſtrations by him given of them he affirms to be different from thoſe of others, that ſo this work of his might not only be entire, but new.

He hath alſo given a method of demonſtrating the Sections of the Conic ſurfaces that have for baſe Parabola's, Ellipſes and Hyperbola's; as alſo thoſe of Cylindrical ſurfaces, which have for baſe the ſame Curves as well as the Circle. Of the Uſefulneſs of all which he believes every one that is knowing in Geometry is ſufficiently perſwaded.

Since the publication hereof, this ſame Author hath printed in *Latin* a ſheet, with elegant Schemes belonging thereto, *De Cycloide & Sectionibus Conicis*; wherein he promiſes a continuation of this doctrine; which, together with what is already extant, we expect wholly in Latin, and it is the more deſirable, becauſe we find him affirming, that he hath ſtudied the Mathematicks, and eſpecially this part of them, for many years.

III. *Ophthalmographia, ſive, Oculi ejuſque partium Deſcriptio Anatomica. Auth.* Guil. Briggs *A.M. & Coll. Corp. Chriſti in Acad.* Cantabr. *Socio.* Cantabrigiæ 1676. *in* 12°.

THis Author having premiſed ſome general Conſiderations touching the Eye, and therein given an account, amongſt other particulars, of the reaſon why there is made but one ſenſation by both Eyes, and why ſometimes the object appears to be double; deſcends to the examination of the parts of that organ; and firſt, to the *Muſcles*, and their Uſes: Then to the *Coats*, where he conſiders, why the *Uvea* or *Choroides* is black in Men, but of divers colours in Brutes; why the Northern Nations have generally grey, but thoſe of the Torrid zone, black eyes; and why the *Iris*, proceeding from the *Uvea*, is of ſo variegated a colour in ſome Individuals; concerning which latter he is of opinion, that that comes from the extream fine texture of the filaments of the *Iris*, by way of undulation diſpoſing the lucid matter, from a different reflexion, into ſuch colours. Further, when he diſcourſes of the *pupilla*, and its contraction and dilatation, together with the cauſe of that motion, he ſuggeſts, that, becauſe the pupil cannot be duly dilated, whilſt we lift up our eyes, and conſequently not admit ſo many rays as otherwiſe, the Stars do appear leſs about the Meridian, than in the Horizon. Again, when he examines the *Retina*, he takes notice, that that coat is made up of medullar fibres, betwixt which and the brain there intercedes a very great communication; upon which account he holds it to be the principal

organ

organ of vision; undertaking to answer those Reasons and Experiments, that have been alledged by Monsieur *Mariotte* and Monsieur *Picard* in favour of the *Choroeides*.

Having done with the *Tunicles*, he passes on to the *Humors*, and renders a reason of their different density. Then he assigns the Use of the *Aqueous* humor; and recites a remarkable case of an Old mans Sight restored; who being seventy years of age, and having used Spectacles for the space of ten years, had, upon taking a great cold, this humor so repaired, that, when the Author wrote this Discourse, that Ancient man had then for the time of six years used no Spectacles at all, but been able without them to read the smallest print.

Speaking of the *Crystallin* humor, he observes, that the anterior part thereof, in Man and Quadrupeds, resembles the segment of a greater Ellipse, and the posterior, that of a smaller, that so the rays being duly refracted may pass as they ought into the *retina*: Whereas in *Fishes* the figure of this humor is more globous, to the end that it might the more refract the rays, which passing through water, as a medium of the like density with it, would otherwise not acquire their due refraction. As to the *Vitreous* humor, he judges it to be of that nature, that being once lost, it *can never be* repaired, whatever *Kerckringius* do pretend to the contrary; though our Author thinks, the *Aqueous* humor *may*. The Use of these Humors appears in this, that vision chiefly depends from the refraction of the rays transmitted through these humors.

Next, he treats of the *Arteries*, *Veins*, and *Nerves* of the Eyes, together with the *Motion* of the *Animal spirits* in them. Here, among other particulars, he shews, that the Fibres of the Optic Nerve about the place of their union are not at all confounded, but run on from the Brain distinctly; as also, that when the *nervi motorii* near the *infundibulum* are by some sharp humor irritated, the Eyes will be thereby convulsed; concerning which he relateth a remarkable instance of a young man that died of such a convulsion. As to the *Motion* of the *Animal spirits* in the Muscles of the Eyes and in the Optic Nerve, he conceives, that, when that is gentle and even, we apprehend things distinctly; but when 'tis uneven and desultory, we then have confused phantasms of things, as it happens to young Tobacconists and young Navigators, growing giddy

giddy and ſick. Touching the reaſon, why *Cats* and *Horſes* are ſenſible of the leaſt impreſſions of light, he alledges it to be this, that they have a great ſtock of animal ſpirits, keeping the membrans of the Eyes very well diſtended: Where he takes notice of a Man, of a hot temper, by him known, who had ſuch Cats-eyes, that he could read a Letter in the dark, where he, the Author, could hardly ſee the Letter it ſelf. The cauſe, why ſome Animals, as *Turkies* and *Buffalo*'s cannot endure the ſight of *Red*, he conceives to be, that the rays of light are thence caſt with a too rapid motion upon their animal ſpirits, and thereby enrage them; there being required a due proportion between the motion of the Spirits and the Lucid rays.

Further, he takes notice of the *Glanduls* and *Lymphatic* veſſels of the Eyes; where he gives an account, why Women and Children are ſo prone to cry; why tears are ſalt; why people do weep both in ſudden Joyes, and in Sadneſs, as alſo in ſneezing, violent laughing, and eating of very ſharp things, as Muſtard, &c.

After this, he treats of the different Formation of the Eye in divers Animals, and even in Individuals of the ſame *ſpecies*. Here he conſiders the peculiar ſtructure of the Eyes of Owles, Bats, Cats, Fiſhes, Birds, Oxen, Horſes, Sheep, &c. yet without noting the extraordinary fabrick of the *Cameleon*.

Laſtly, he inſtructs young Anatomiſts in the manner of the diſſection of the Eye, having firſt ſhew'd the manner how Viſion is performed.

BEſides theſe *three* Books, we cannot but take notice here of a *fourth*, which, though a very ſmall one, yet appears very uſeful, more and more to promote in theſe Kingdoms all Hortulan affairs: It is entituled;

Nurſeries, Orchards, Profitable Gardens, and Vineyards encouraged; the preſent Obſtructions removed, and probable Expedients for the better Progreſs propoſed: For the general benefit of his Majeſties Dominions, and more particularly of Cambridge, *in the Champain-Countries, and Northern parts of* England: *In ſeveral Letters out of the Country, by Dr.* John Beale *and Mr.* Anthony Lawrence.

Of theſe Letters, though hitherto there be printed but Two; yet

yet it is presumed, that more will shortly follow from the same hands.

A Declaration of the Council of the *Royal Society*, passed *Novemb.* 20. 1676; relating to some Passages in a late Book of Mr. *Hooke* entituled *Lampas*, &c.

Whereas the Publisher of the Philosophical Transactions *hath made complaint to the* Council of the Royal Society *of some Passages in a late Book of Mr.* Hooke, *entituled* Lampas, &c. *and printed by the* Printer *of the said Society, reflecting on the integrity and faithfulness of the said Publisher in his management of the Intelligence of the said Society: This Council hath thought fit to declare in the behalf of the Publisher aforesaid, That they knew nothing of the Publication of the said Book; and further, That the said Publisher hath carried himself faithfully and honestly in the management of the Intelligence of the* Royal Society, *and given no just cause of such Reflections.*

THe *Council* having thus justified the Publisher; he shall only add that part of a Letter, written to him by M. *Christian Hugens de Zulichem* the 20*th.* of *Februar.* 1675, which relates to the taking out a Patent of his, the said M. *Hugens*'s, Invention; and then let the world judge of the Postscriber's accusation about an endeavour of defrauding him of *his* Contrivance: The words of the said Letter, Englished, are these;

For the rest, Sir, *if you believe, that a Priviledge* (so he calls a *Patent*) *in* England *would be worth something, and that either*

either the Royal Society *or* You *might make some advantage thereof, I willingly offer you all I there might pretend to.*

So that, if there was a desire in the Publisher to take out a Patent, it was for no other contrivance, but M. *Hugens*'s, formerly sent to the *Royal Society*, and printed in *Numb.* 112. of these Transactions.

Errata.

P. 711. l. 14. del. *Longitude found by* H. Bond *Sen.* p. 716. l. 9. r. *the ingeniousness*, ibid. l. 13. r. *with the former.*

Imprimatur,

Novemb. 23. 1676.

BROUNCKER, P. R. S.

LONDON,

Printed for John Martyn, *Printer to the* Royal Society, 1676.

Tr. N°129

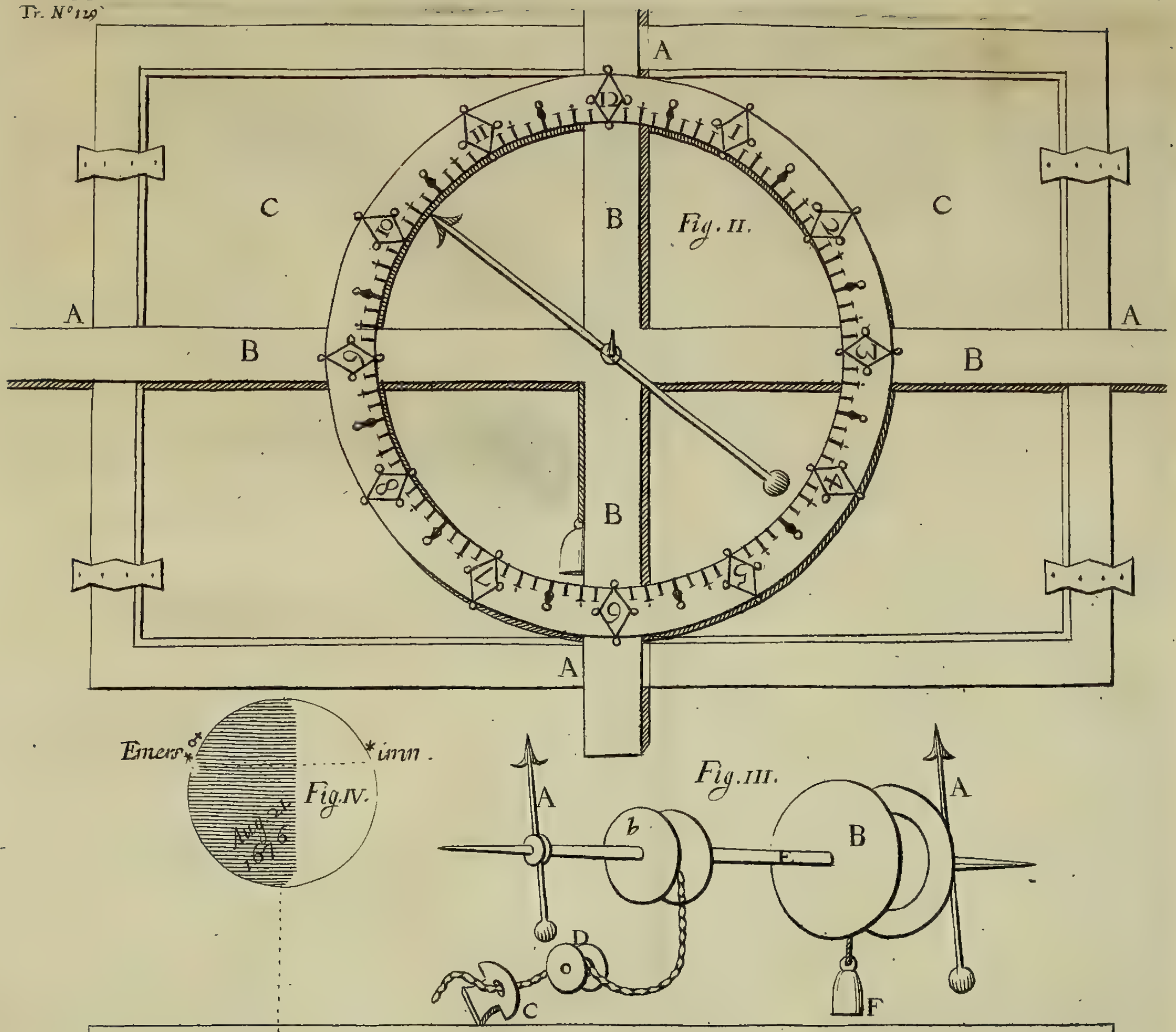


Fig. II.

Fig. IV.

Fig. III.

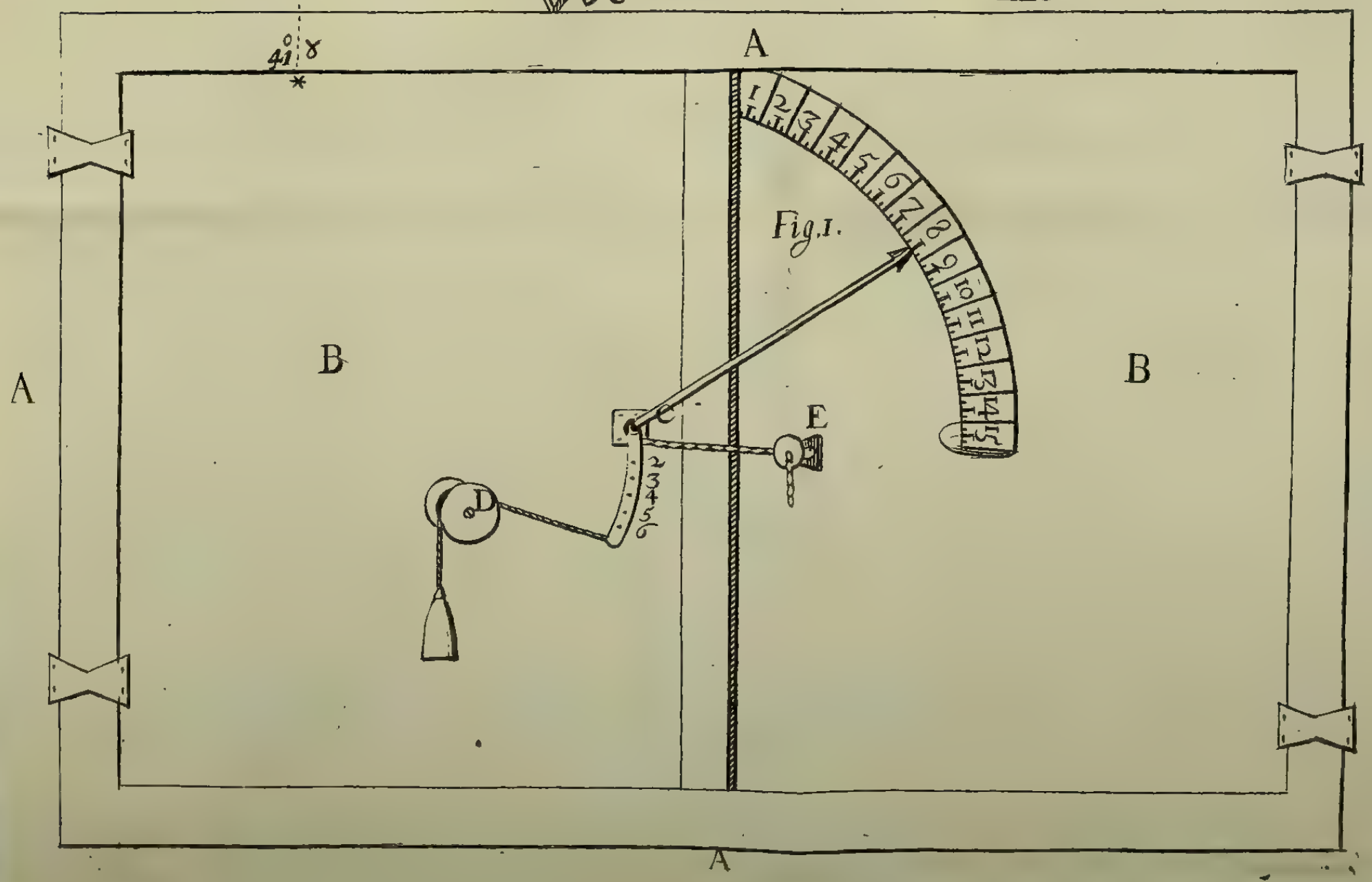


Fig. I.

BRITISH MUSEUM
NATURAL HISTORY

PHILOSOPHICAL TRANSACTIONS.

December 14. 1676.

The CONTENTS.

More Observations of Monsieur Taverniers *Voyages, promised in the foregoing Tract. Some Observations concerning the Lake of* Mexico. *An Account of a strange and very noxious sort of* Rey, *growing sometimes in certain parts of* France. *A Letter written by Dr.* Lucas Hodgson, *containing some Observations of his about a Subterraneal fire in a Coal-mine near* Newcastle. *An Account of some Books:* I. Roberti Boyle, *Nobilissimi Angli & Soc. Regiæ dignissimi Socii, OPERA VARIA*; Genevæ. II. *An Account of several Travels through a great part of GERMANY in four Journeys, &c. By* Edw. Brown, *M. D. &c.* III. Caspari Bartholini, *Diaphragmatis structura nova, unà cum Methodo præparandi Viscera, &c.* IV. *Longitude found, by* Henry Bond *Senior.* V. *The Royal Almanack, by* N. Stevenson.

More Observations of Monsieur Taverniers *Voyages; promised in the next foregoing Tract.*

THe *Second* Volume of these Voyages treats of *East-India*, and the neighbouring Islands, in *three* Books: The *first* is of the Roads from *Ispahan* to *Agra*, and from *Agra* to *Dehli*, and *Gehanabat*, where the Court of the Great Mogol is at present; as also to the Court of the King of *Golconda*, and to that of the King of *Visapour*, and to divers other places of *India*. The *second* is an Historical and Political description of the Empire of the *Great Mogol*. The *third*, a narrative of the Religion of the Mahumetans in those parts, and of that of the *Indian* Idolaters; together with an Account of the Authors voyage by Sea from *Suratte* to *Batavia* in *Java major*, and from thence into *Holland*; interspersing many particulars of divers kingdoms of the East.

Among the many Observables, contain'd in this Tome, we take notice; 1. That the Author describes the Figures of the Golden, Silver and Copper-coins of the several Countries of

Asia, as also of the Shells and other substances which there pass for mony.

2. That in the road from *Suratte* to *Agra*, by the way of *Brampour* and *Seronge*, there is a Village, called *Navapoura*, where the Rice, which is less than other rice, acquires the scent of Musk by boyling.

3. That there are to be met with, admirable Juglers and Mountebanks in the road from *Suratte* to *Agra* by the way of *Amadavat*; by some of whom the Author affirms he saw done what follows: They kindled a great fire, and in it heated some Iron-chains red-hot, which they laid about their bodies, without receiving any apparent hurt thereby. They took also a little piece of wood, and having fix't it in the Earth, they demanded of the Spectators, what kind of fruit they would have grow upon it: It being answered, *Mangos*; one of the Juglers crew cover'd himself with a Linnen cloth, and stoop'd down to the ground five or six times. At which time one of the Spectators having placed himself so that he could observe what that Jugler did, saw, that with a Razor he cut his flesh under his arm-pits, and with the blood thence issuing, rubbed the said piece of wood. Whereupon every time that he raised himself from stooping, the planted stick of wood was visibly grown; and at his third rising, branches came forth with buds; at the fourth, the Tree was cover'd with leaves; and at the fifth, blossoms were seen upon it. But then a Minister of the *English* President being one of the Bystanders, when he saw, that out of a piece of dry wood those Juglers did in less than half an hour make grow up a Tree of four or five foot high, with leaves and blossoms, was by his zeal carried to stop the progress, and openly to declare, that he would never give the H. Communion to any one of those that should stay any longer there to see more of such (by him reputed Magical) things. Which spoiled the Juglers proceedings, and made the said President dismiss both the Company, and the Juglers together.

4. That in *Amadavat*, the wife of a rich *Banian* being barren, and yet extreamly desirous of children, was told by a domestick, that if she would eat of a certain kind of living creature, she would assuredly be with child; and that that creature was nothing but a certain little Fish, of which she should eat but three or four. Now, the religion of the *Banians* not permitting them

them to eat any thing that hath had life; this woman ſcrupled to comply with the advice given her. But the Adviſer having told her, that he would ſo diſguiſe the thing, that no body ſhould know it to be fiſh, ſhe at laſt reſolved to eat of it: Which done, the night following ſhe had the company of her husband, and not long after perceived her ſelf to be with child; though ſhe was not ſo happy as to enjoy the life of her husband till ſhe was deliver'd. He therefore being dead, before ſhe was brought to bed, the Relations of her husband, pretending to his eſtate and goods, the widdow oppoſed them, alledging that ſhe was with child by him, and deſiring they would have patience till ſhe were deliver'd. They, being ſurprized hereat, told her, ſhe jeſted with them as having been married to her husband 15 or 16 years without ever having been with child. The widdow being continually importun'd by them, addreſs'd her ſelf to the Governour of the Country, acquainting him with the whole ſtory: who order'd thereupon, that thoſe Relations ſhould ſtay till ſhe was brought to bed. She being well deliver'd not long after, the kinſmen of the defunct, people of credit, would maintain that the child was not legitimate. The Governour, endeavouring to know the truth hereof, conſulted with ſome Phyſicians, who deſired, that the child might be brought into a bath, and that, if the remedy, by her uſed, were true, the ſweat of the child would ſmell of fiſh. Which being done, the matter fell out according to what the Phyſicians had predicted: Whereupon the Eſtate was by the Governour adjudged to the child. But the Relations not being ſatisfied therewith, appealed to the Grand Mogol himſelf at *Agra*. Which made that Prince to command a Letter to be written to the Governour, enjoyning him that he ſhould ſend to him the Mother and the Child, to make the aforementi-on'd Experiment in his preſence. Which having been done, with the like ſucceſs as before, the Relations of the deceaſed husband were obliged to deſiſt, and the Mother and Child remained in the quiet poſſeſſion of the Eſtate.

5. *In Elephantorum familia, fœmellas jacere ſupinas in coitu; & libidinis æſtro percitas, coacervare omnis generis folia & herbas, ex quibus cubile quoddam ſibi ſtruant valdè commodum, unà cum pulvinari quodam herbaceo, 4 vel 5 pedes reliquâ lecti parte altiori.*

6. That the Author affirms to have given us an exact Liſt of all the Merchantable Commodities, furniſh'd by the Empire of

the G. *Mogol*, and the two kingdoms of *Golconda* and *Viſapour*, and other neighbouring States; and of all what Nature and Art afford there: *viz. Silks*; various *Cloths*, white and painted; *Cottons*, ſpun and unſpun; *Indigo*, *Saltpeter*, Spices (*Cardamum*, *Ginger* and *Pepper*,) *Diamonds*, *Rubies*, *Pearls*, *Bezoar*, *Musk*, *Sugar*; beſides ſome Drugs, that indeed are found at *Suratte*, but are brought thither for ſale from other Countries, as *Sal Armoniack*, *Borax*, *Gum-lac*, *Saffron*, *Cumin*, *Mirrhe*, *Frankincenſe*, *Opium*, *Lignum Alcës*, *Licoriſh*, *Caſſia*, *Coffe*. To all which he hath annexed an account of the Cheats uſed in divers of theſe commodities, eſpecially in the *Silks*, *Cloths*, *Cottons*, *Indigo*.

7. That the penetrancy of the powder of *Indigo* is ſuch, that whilſt they are ſearſing it, or ſee it ſearſed, they are obliged every half hour to drink a draught of Milk to waſh it down; and that, all this notwithſtanding, they yet often find, that haveing been for nine or ten days together buſie about this work, whatever they ſpit for ſome while, is blewiſh. And that the Author hath often obſerv'd, that having in the morning put an Egg near theſe Searſers, it hath been found in the evening all blew within.

8. That 'tis certain, that the Nutmeg-tree is not planted, but the fruit of it ſown by birds, ſaid to ſwallow the Nutmegs whole, and voiding them whole without digeſtion, cover'd with a viſcous matter; whereupon they take root and grow up to a Tree. Again, that the Birds of paradiſe eating this fruit, are intoxicated therewith, and fall down dead upon the place; whereupon Emmets come and eat off their legs, and other parts.

9. That Sugar being kept thirty years, becomes poyſon, and that there is hardly any thing more dangerous than that, when eaten of that age.

10. That the Author affirms to be the firſt of *Europeans* that hath been in the Diamond-mines; of which he ſaith there are four known and noted ones; two of them being Rivers, out of which thoſe precious Stones are gotten, at one of which he ſaith he hath been, as well as in the other two that are in Rocky Mountains: Of which two the *one* is at *Raolconda* in the dominions of the king of *Viſapour*; the *other* at *Gani* or *Coloure* in the kingdom of *Golconda*. The *third* is in the River, at *Sommelpour* or *Gonel*; in the ſand of which River, when 'tis ſhallow, Diamonds are found. The *fourth* is in the Iſland of *Borneo* in the River

River *Succadon*, where, it seems, the Author hath not been: Who observes, that round about the place where Diamonds are found, the ground is sandy and rocky, much like that of *Fontainbleau* in *France*: And that in those Rocks are many veins, sometimes half an inch broad, sometimes an inch; the Mine-men having little Iron-hooks, with which they fetch out the Diamantin-oar: Which veins, *he saith*, do not alwaies run streight, but are sometimes ascending, sometimes descending. The Oar they wash two or three times, and in it seek the treasure. As to the flaws, often found in Diamonds, *he saith*, that they proceed from hence, that the Mine-men do often strike such forcible strokes with a great Iron-crow, that that stuns the Diamond and so flaws it. To know the value of Diamonds, if they be good every way, our Author gives this Rule: That if a good Diamond weigh one *carat*, 'tis worth 150 *French livres*; and then to know, how much a good stone (*e. g.*) of 12 *carats* is worth, you are to multiply 12 in it self, which makes 144; which product is to be multiplied by 150 (the price of one of a single *carat*,) which will make 21600 such *livres*, the price of a Diamond of 12 *carats*. But if the Diamond be not perfect, then you are to allow but 80 *livres* for a *carat*; and if such a kind of Diamond should weigh 15 *carats*, then multiply 15 in it self, is 225, and this into 80, makes 20000 *livres*, the value of that Diamond. According to which rule, the Diamond of the G. *Mogol* (weighing $279\frac{8}{16}$ *carats*, being perfect, and having been handled by our Author) will amount to 11723278 *French livres*. If it weighed but just 279 *carats*, it would be worth only 11676150 *livres*; the odd $\frac{8}{16}$ coming to 47128 *livres* in such a Stone, as the Author computes it.

11. That Rubies, Topazes, Saphirs, Hyacinths and Amethists, are found in the kingdom of *Pegu*, in Mount *Capellan*; and also that some of them are found in a River in the Island of *Ceylon*. Concerning the rate of *Rubies* in particular, *he saith*, that when any of them exceeds 6 *ratis* (a *ratis* being $\frac{7}{8}$ of a *carat*) and is perfect, they sell them at what price they please.

12. That *Turkoises* are no where found but in *Persia*, where he saith there are two Mines of them, the one called the *Old rock*, near *Nichabourg*, three days journey from *Meched*; the other, the *New rock*, five days journey from the former; and that those of the latter Mine, being of a faint and whitish blew, are but little esteem'd.

13. Of

13. Of *Pearls* he hath this remarkable obſervation, *viz.* that he had one Pearl-oyſter in his hand, that had *ten* pearls in it, though of different bigneſſes; they being, in his opinion, bred in Oyſters, as Eggs are in the belly of Fowl. Further, he takes notice of a Pearl in the Cabinet of the King of *Perſia*, which coſt him 32000 *Timans*, or 140000 *French livres*; the greateſt that is known; as alſo of two Pearls, ſhap'd like a Pear, one of 70, the other of 56 *ratis*: and eſpecially of a Pearl belonging to a Prince of *Arabia*, which, *he ſaith*, goes in beauty beyond all the Pearls in the world; it being perfectly round, and tranſparent, weighing 14 *carats*.

14. That *Musk*, when 'tis firſt drawn out of a certain bag of the Musk-deer, 'tis like Blood coagulated: That moſt of it comes out of the kingdom of *Boutan*, between 56 and 60 degr. Northern Latitude; but that *Cochin-China* alſo and *Tunquin* do furniſh ſome quantity. Concerning the ſaid Kingdom of *Boutan* (which is tributary to the G. *Mogol*) he notes, that people travel into it from *Patna* in *Bengala*, taking their march Northward, even to the 60*th.* degree, fetching from thence not only excellent *Musk*, but choice *Rhubarb*, and an uſeful Seed, call'd *Worm-ſeed*. Of the People of this Kingdom he relates, that they have had the uſe of Muskets, Canon and Powder for ſeveral ages; they giving out, that they now have pieces of Canon, on which are found Cyphers or Letters demonſtrating them to be above 500 years old. This is that very Kingdom (*ſaith our Author*) through which the Ambaſſadors of *Muſcovy* paſſed A. 1659 into *China*, they taking their road all along the Great *Tartary* on the North of *Boutan*: Which Ambaſſadors, if they had complied with the cuſtomes and ceremonies of *China*, we might probably have at this day a beaten road by land from *Muſcovy* to *China*, by the North of *Tartaria Magna*, and much more knowledge of the Kingdom of *Boutan*, which is neighbouring thereto; and of more other Countries, of which we hardly know the names: A thing, that might have proved a great advantage to all *Europe*.

15. That *Bezoar* is found among the excrement that is in the paunch of certain Goats, that feed on a plant, the name of which the Author ſaith he hath forgot. This plant is ſaid to thruſt out certain buttons, about which and the extremities of the branches, eaten by theſe Goats, the Bezoar is form'd in their belly. 'Tis added, that the Bezoar takes its form according to that of the

the buttons and the ends of the branches; whence come so many different figures. 'Tis further noted, that the Country-people by feeling the belly of the Animal that breeds the Bezoar, know what quantity it hath, and sell it accordingly. They slide both hands under the belly, and beat the paunch longwaies on both sides, whereby all the stones are said to fall into the middle of the paunch, whereby they are enabled to count their number. 'Tis further observ'd, that the Bezoar is very liable to be counterfeited, even by giving to the false ones as many coats as the true ones are wont to have. But to discern the cheat, you must *either* weigh it, and then lay it for some time in luke-warm water; and, if the water changes not its colour, and the Bezoar loses nothing of its weight, 'tis not counterfeit: *Or*, you must touch it with a pointed Iron heated red-hot; and if the Iron enters, and makes it brown like fried meat, 'tis not natural. Concerning the value of Bezoar, our Author affirms that it riseth as that of Diamonds doth: For, if five or six Bezoars together weigh one ounce, they are sold for 15 to 18 *French livres*; but if one Bezoar weighs one ounce, that ounce is worth 100 such *livres*. He saith, that he hath sold one of $4\frac{1}{4}$ ounces, for 2000 *Fr. livres*. The Goat that breeds these Stones, is, by his description, a very fine and tall creature, having hair as fine as silk.

16. That there is also a sort of Bezoar, yielded by *Cows* of that Country, but not much esteemed. Another sort there is, bred by *Apes*, in *Macassar*, so strong, that two grains do as much as six of that of the Goats. This, *he saith*, is alwaies round, much rarer and therefore much dearer than the other.

17. That there is another Stone, highly esteem'd, called the *Porcupin stone*, which is in the head of this Animal, though sometimes also in its belly; said to be more soveraign against poyson than any Bezoar. Having been infus'd a quarter of an hour in water, 'tis here affirm'd to be as bitter as any thing in the world.

18. That the *Serpentin-stone*, is also held very excellent for drawing out poyson.

NB. It was omitted above, in *n.* 9. that the figure of that big Diamond of the G. *Mogol* is that of half a Hens-egg; as also, that the biggest Diamond of the G. Duke of *Tuscany* is of $139\frac{1}{2}$ *carats*, tending somewhat to a Citron-colour. At *Golconda* our Author saith to have seen one of $242\frac{5}{16}$ *carats*, for which they asked 750000 *French livres*, or 500000 *Roupies*. He adds, that

himself

himself bought one of 157½ *carats*, rude; and that, when cut, it retain'd 94½ *carats:* And, that he bought another of 63 *carats*, &c.

An Extract of some Observations, to be met with in the Journal des Scavans; *concerning the Lake of* Mexico; *and a strange sort of* Rey, *growing sometimes in certain parts of* France.

1. THe Lake of *Mexico* hath this of extraordinary and perhaps peculiar, that part of its water is Sweet, and the other part Salt; which make it believed to be derived from two sources, whereof the one holds sweet water, the other comes from some mineral and salin Earth, found in the hills, through which this water passeth, and is impregnated with the salt which is dissolved in its course: Or, if it hath no peculiar source, it must be, that that, which makes part of the Lake salt, is the bottom or the Earth under the water, being in that place full of salt: which is confirm'd by Experience, much Salt being made of it every day, of which that City drives a great trade with remote parts, even the *Philippines* themselves, whither it is transported in considerable quantities. That part of the Lake which is sweet, is still and quiet; the salt part is agitated and moved according as the winds blow. The sweet water is very good and wholesom, breeding plenty of little fishes. That which is mov'd, is bitter-salt, breeding no fish at all. The sweet water is higher than the other, and falls iuto it. The water of the Salt part is seven leagues long, and as many leagues broad, and hath above 22 leagues in compass. That of the Sweet water is near as big; and the whole Lake contains about 50 leagues in compass. Formerly there were near 80 Towns seated round about this Lake, some of which contain'd 5000 Families, and some above 10000. At the present there may be a matter of thirty Burroughs and Villages, of which the greatest holds not above 500 Houses; all the rest having been ruined by the revolutions in that Country.

2. Some years since, M. *Perrault* related to the R. Academy of *Paris*, that travelling through *Sologne*, he had been informed by some Physicians aud Chirurgions of that Country, that the *Rey* was there sometimes so corrupted, that those who did eat of the bread which had much of this corrupted grain in it, were seised on by a Gangrene, some in one part, some in another, some losing a finger, others a hand, others a nose, &c. and that this Gangrene was not preceded by any fever, nor inflammation, nor

conſiderable pain; as alſo that the Gangren'd parts fell off of themſelves, without any need of ſeparating them by any remedies or inſtruments.

We have viewed ſome of theſe grains of Rey thus degenerated. They are black without, and pretty white within, and when they are dry, they are harder and cloſer than the natural good grain. They have no ill taſte. I have found ſome of them, that had hanging at their baſis a ſubſtance of a hony-taſt and conſiſtence. They become much longer in the ear, than the other. There are ſome of them that are 13 or 14 lines long, and two lines large, and at times you will find 7 or 8 of them in one ear. It may be ſeen in examining theſe Ears, that they are not bodies of another kind, generated among the grains of Rey, as ſome pretend; but that they are true grains of Rey, having their coats like the reſt, wherein may be diſtinguiſht the place of the germen and of the furrow.

Monſ. *Bourdelin* having acquainted us, that 1674 there happened many the like accidents at *Montargis* from the ſame cauſe, the Company gave M. *Dodard* order to inform himſelf about it: He accordingly cauſed to be brought to him ſome Ears of this Rey, and the Company found the grains of them altogether like thoſe they had ſeen formerly. He ſent notice hereof to ſeveral perſons, among others to M. *Bellay*, chief Phyſician to her Royal Highneſs *Madamoiſelle*, and to M. *Dubé* a famous Phyſician at *Montargis*. He hath alſo entertained therewith M. *Tuillier* Dr of Phyſick of the Faculty of *Angiers*, a very knowing and very curious perſon, who hath imparted to him a Letter of M. *Chatton*, an old and expert Chirurgion at *Montargis*; whence he ſaith he hath learned the particulars following;

Rey doth in this manner degenerate in *Sologne*, *Berry*, the country of *Blaiſe*, and *Gaſtinois*, and almoſt every where, eſpecially in light and ſandy land. There are few years but ſome little of this ill grain grows. When there is but little, the ill effects of it are not perceived. It grows plenteouſly in wet years, and moſt of all when after a rainy Spring there follow exceſſive heats.

The conſtitution of the Air or of the Rains, which impreſs this malignity in the Rey, is rare, there having been found none at *Montargis* but thrice in 38 years, and there having been but few diſtempers of it the ſecond time, becauſe there was but little of that corrupted grain.

The bread made of the Rey which holds ſome of this corrupted corn, taſts neither worſe nor better than other. The Rey thus corrupted hath its effects chiefly when 'tis new, yet not till it hath been uſed a conſiderable time.

Theſe effects are, to dry up the milk in women; to cauſe ſometimes malign Fevers, accompanied with drowzineſs and raving; to breed the gangren in arms, but moſt in legs, which ordinarily are corrupted firſt, and to which this diſtemper faſtens it ſelf, as the Scorbut doth.

This corruption is preceded by a certain ſtupefaction in the legs; upon which follows a little pain, and ſome ſwelling without inflammation, and the skin becomes cold and livid. The gangrene begins at the center of the part, and appears not at the skin but a long while after, ſo that people are often obliged to open the skin to find only the gangrene lurking under it.

The only remedy for this gangren is to cut off the part affected. If it be not cut off, it becomes dry and lean, as if the skin were glued over the bones, and 'tis of a dreadful blackneſs, without rottenneſs.

Whilſt the legs are drying up, the gangren aſcends to the ſhoulders, and one knows not, which way it communicates it ſelf.

We have as yet not lighted upon a ſpecifick remedy againſt this evil. There is ſome hope of preventing it by hot Spirits and volatil Salts. The *Orvietan* and ptiſane of *Lupins* do conſiderable good to the perſon diſtempered. Poor people are almoſt only ſubject to theſe evils.

M. *Tuillier* writes M. *Dodard* word, that in the year 1675. he ſaw much of this cornuted grain among the Rey of the Country of *Gaſtinois*, and that the Country-people told him, that there was much more of it this year, than the laſt year, and that it cauſed great diſorders: And yet 'tis certain, that this Summer hath rather been cold than hot, and that there hath not been any conſiderably intemperate weather this year, but exceſs of wet. M. *Dodard* avers, that he hath ſeen much of this black grain among the Rey upon ſandy grounds, and the grains and ears he hath brought thence, appear'd to the ſaid Company altogether like thoſe which M. *Dubé* ſent from *Montargis*.

Mean time, it may be doubted whether theſe gangrens are the effect of this corn eaten, and whether the corruption of the Rey, and that of the parts in the bodies of men are not acci-

dents

dents equally derivable from the same constitution of the Air, and independent the one from the other. But, if this gangren seiseth only on those that eat Rey-bread, and comes not upon them but in such years when there is much Rey corrupted, it seems to be certain, that this corrupted Rey is the cause of this gangren. To assure our selves the more of it, the Company gave order to make bread both of this Rey alone, and of the same Rey mingled in different proportions with good Rey, to observe the different effects of this Rey and of these different mixtures upon brutes of different kinds. And to omit nothing that may serve to know the causes of this corruption; M. *Marchand* hath been desired by them to cause some of that sandy earth where it grows to be brought, and to plant in it some grains of Rey not corrupted, and to water them very much during the Spring, to see, whether there be some particular cause of this corruption besides the superfluous humidity. And to give occasion the better to know, wherein consists this corruption, they have desired M. *Bourdelin* to make a Chymical analysis of this *corrupted* Rey, which they intend afterwards to compare with the Chymical analysis they have made of *good* Rey.

Whilst these Experiments are making, I shall tell you (saith M. *Dodard*) that M. *Tuillier* has assured me, that in the year 1630, which was fatal to the poor of the Countries subject to these evils, he being at *Sully*, and having understood by a Physician and Chirurgion, that the cornuted Rey was the cause of the gangrens that were then very frequent, being desirous to satisfie himself, whether this grain was indeed the cause thereof, he gave of it to several Animals, that died of it.

The Company intends to examine very strictly this sort of Rey that shall be brought them from several parts, thereby to furnish the Magistrate with instructions to prevent those evils that may be caused by this corrupted corn, and to use such precautions as they shall judge necessary; of which the chief may be, to advertise the people of this evil, and to oblige them to sift the Rey, and to forbid the grinders of corn, to grind any Rey that has such grains in it, which is so easie to know, that there can be no mistake in it.

A Letter written by D. Lucas Hodgson, *Physician at* Newcastle, *containing some Observations made by him of a* Subterraneal Fire *in a Coal-mine near that City.*

SIR, *Newcastle* May the 15. 1676.

I Had long since returned my humble thanks to the *Royal Society* for their candid acceptance of my paper; and particularly to you for your most obliging Letter, had I not thought a farther account of what I have observed in the fire, would be more acceptable to that Illustrious Body; particularly to the Honourable Mr. *Boyle*, for whose ingenious *Queries* I give him most hearty thanks, accounting my self happy, that by this occasion any thing of mine should come under the consideration of so worthy a person. To the end therefore that I might return more than words, (as my occasions would permit) I have several times visited the fire, diligently observing what might occur at the various places of its eruption, whereby I am in some measure enabled to give a particular Answer to his desire in that matter.

Qu. 1. *Whether the vents of the Subterraneal fire are not subject to paroxysms or great fits of eruption at times?*

2. *Whether those notable eruptions do happen regularly at any set times, or fortuitously; and if at set times, whether these times be the beginnings, middle, or endings, of any of the four seasons of the year?*

3. *Whether from the eruption, the silence or suppression, or the smoaking of the Subterraneal fires, any certain or probable prognostick can be made of changes of weather, or of Meteors; and if they can, how long they are wont to precede the things they presage?*

Answ. This Fire keeping no analogy with other Vulcanio's in any of the particulars mentioned in these three quæries, I thought fit to answer them altogether to avoid prolixity, seeing all I can observe is, that it increaseth or decreaseth according to the subject it feedeth on; which is for the most part a *Day-coal**, as they call it, so that you may light a candle at it in some places, in other places it is some fathoms deep, according as the Day-coal heightens or deepens; in other things it is no ways instructive.

* *The upper Seam of the Coal, next exposed to the Air.*

4. *Whether the Marcasites that are found in or about the Burning Coalpits be of such a nature, as being laid on heaps small or great, and drench't with rain, or other water, they will of themselves actually take fire?*

Ans. I remember that Dr. *Power*, in his book of *Microscopical Obser-*

Observations pag. 62, takes notice of such an accident; but I do not understand that any with us have observed the like.

5. *Whether in those Coalmines they find any actual Sulphur in its proper form, that may safely be concluded not to have been produced by the action of the fire upon the Marcasites?*

Ans. I never saw any, nor any man else that I can hear of.

6. *Whether the* Sal armoniac *be found any where thereabouts, save in those places where an actual fire hath come, and also which have been accessible to the Air?*

Ans. No *Sal armoniac*, nor any thing like it to be found, except at the fire.

7 *Whether at the mouth of these Igneducts, where flowers of Sulphur and Sal armoniac are found, there do issue forth any steams or exhalations that may be rather lookt upon as the productions of actually kindled Sulphur, than of Sulphur barely sublimed? Which may be tried by holding over the vent Red rose leaves, or any of those other bodies that are wont to be blanch't, or made pale by the fume of burning Sulphur?*

Ans. There being such a mixture of the steams of Sal armoniac and Sulphur rising together in most places, it is hard to distinguish them; for though the flowers of Brimstone seem to rise first, yet there is commonly a crust of Sal armoniac under them; as for the Experiment, I shall try it as soon as any Roses are blown.

8. *Whether the milky substance that is mentioned in the paper, be ever found among Metallin oars, or meerly among stones; and whether it be found so surrounded every way with stone, that no channel or other visible passage can be found, at which it may probably be suspected to have entred into the Cavity wherein it was lodged?*

Ans. The Milky substance is found no where but where the Sal armoniac and Sulphur are totally gone, and the acid part or Aluminous Spirit of that white mass will also take wing by the increase of the fire, leaving a *caput Mort.* dry, stiptick and as hard as a stone; yet I account that a pound of this mass, before the fire press too much upon it, will go near to afford by Solution, &c. half a pound of tolerable crystallin Allum; but why this substance should rise so high as the surface of the Earth, though I have some reasons, yet they not being satisfactory to my self, I shall not trouble you with them.

9. *Whether in the places where the Sal armoniac is found, the neighbouring soil be nitrous, or do yield any store of common Salt?*

Ans.

Anſ. The Neighbouring ſoil differs little from other grounds with us, having neither common Salt, nor Niter in it; for though there be a Salt-well with us, yet it is both on the other ſide of *Tyne*, and a conſiderable diſtance from the fire.

10. *Whether near the places that bear* Sal armoniac, *there be any Springs that participate of that ingredient or of ſome other ſubterraneal ſalt? which will be beſt known by a ſlow evaporation, in caſe one have not the conveniency to do it by diſtillation, and thereby preſerve both the aſcending liquor and the Remains, and by then conſidering the remaining ſubſtance, in order to find whether Sal armoniac be impregnated with Mineral bodies not diſcernable in it by the Colour. And there are ſome other Mineral Salts, that, though* white, *are very differing from all the natural Salts that are commonly known, or that I have read of in any Author.*

Anſ. I have induſtriouſly obſerved the Springs that are near the Fire, and find none of them that give the leaſt ſuſpicion of *Sal armoniac.* The water that runs from the adjacent Colyeries is vitrioline, giving as deep a tincture with Galls as *Scarborough Spaw.* In a word, it differs nothing from the waters that ordinarily drown our Colyeries, and coſt our Coal-owners ſo much to be quit of them. The other Springs, moſt of which are dry this year, are of ordinary uſe, containing no Mineral Salts in them: But I hope you will ceaſe to wonder, that Coal ſhould produce a volatile Salt by the action of fire, ſeeing I have gathered *Sal armoniac* from a burning Brick-kiln, where nothing but Clay and Coal is burnt together, and I hope none will expect the volatile Salt in the *Sal armoniac* from ordinary Clay. The reaſon, that firſt prompted me to ſeek this Salt there, was, that the Smell of the Kiln did ſomewhat reſemble that of the Subterraneal fire. There is alſo a ſort of Mineral we call a *Slate*, which is partly Coal, partly Alumſtone, partly Marcaſite, which being laid up in heaps and burnt, are uſed for hardening the Coal-ways; upon theſe heaps, whilſt burning, I have often gathered both *Brimſtone* and *Sal armoniac.*

As for the Experiment of pouring cold water upon the poudred *Marcaſite*, the event was, that it produced a Vitrioline water, but no heat; though I will not deny but the Experiment may ſucceed better, if more accurately handled by that Noble Philoſopher who hath lately been furniſhed with a conſiderable quantity of *Marcaſites* from my worthy Friend and Aſſociate Dr. *Durant*; a greater quantity of which may be ſent if need require; for in little

little quantities I ſuppoſe the Experiment will not ſucceed.

As to the reſemblance betwixt this *Sal armoniac*, and that which comes from Mount *Ætna*, where no Coals are ſuppoſed to be; whence it ſeems to follow, that our volatile Salt may proceed from ſomewhat elſe than Coal. To which difficulty I anſwer, that when I deduced ours from Coal, I did not exclude other bituminous ſubſtances that are analogous to it, of which I ſuppoſe the Country, where Mount *Ætna* is, affordeth no inconſiderable quantity; neither will it follow, that no Coals have *been wrought*, therefore there *are none*; and if trial hath been made, and no Coals found, yet it will be a doubt ſtill, whether thoſe Trials have been ſufficient. However it be, yet I think it were not impertinent (by the way) to enquire, whether the ſagacious *Venetians* may not be beholden to Mount *Ætna*, or ſome other Subterraneal fires, for the *great* quantity of *Sal armoniac* they ſell to our Merchants: for this Fire affordeth no inconſiderable quantity thereof, eſpecially in dry weather; ſome of which I have ſent by my worthy and honoured Friend Mr. *Richard Gilpin*, who was the perſon that firſt brought home part of it from the fire, and in whoſe company it was firſt that I experimented it to be *Sal armoniac*; for till then none took notice of it. And I the rather put this trouble upon him, that by him you may be informed in circumſtances that would be tedious to relate.

The Box I have ſent contains a bottle of the Spirit of this *Sal armoniac* diſtilled from Quicklime, in which I uſed a conſiderable quantity of Spring-water for the diſſolution of both the ingredients, before I diſtilled the Spirit from them.

The great quantity of grey Salt is the *Sal armoniac* as it was gathered from the fire, ſome of it being ſix inches broad, and above when it was taken up.

The white Salts in the white papers are the ſame grey, ſublimed *per ſe* in a Sugar-mold.

The white ſnowy Salt in the Jar-glaſs is the volatile Salt of the ſame, as it comes from the fire. The *Lixivial ſalt* I uſed, was only Potaſhes diſſolved in Spring-water; to the whole I added ſome *Spirit of Wine*, whereby I commonly obtain a greater quantity of volatile Salt in *formâ ſiccâ*, than otherwiſe I could expect.

Now, though it may ſeem incredible to ſome, that Black coal ſhould yield ſo white a volatile Salt, yet they that know that all volatile Salts whatever may be freed from their *fætor* and intenſe colour,

colour, by transmuting them into a *Sal armoniac* by the mediation of an acid, as *spirit of Salt*, *spirit of Vitriol*, *Alum*, &c. and then subliming them till they be white, will cease to doubt of this matter. The reason of which change, I presume, is, because, though these volatile Salts carry over always some of the fetid oyl with them while in a state of volatility, yet being thus in a manner fixed, the fetid oyl must necessarily by force of fire rise first, leaving the subsequent compound Salt, or Sal armoniac without smell; though it is still a doubt, whether the volatile Salt is better or worse for this labour.

As to your Postscript concerning *petrescent Springs*, we have none near us, there is indeed a Cave some miles off, at the furthest end of which few have been; from the roof of which hang large lumps of petrified water, like Icles, some of them reaching down to the ground like pillars, these icles are good Limestone, as I have tried.

I shall conclude when I have acquainted you with a Spirit of *Sugar*, of which a Distiller with us hath a quantity; it seems to be the result of some anomalous fermentation, it is so strong that no man is able to smell at it in an open vessel, without being made almost breathless: neither do I think the person that made it, can make it again. If it prove worth that consideration of the Noble Mr. *Boyle*, I intreat a brief account of his thoughts concerning it, particularly whether it may be used internally or no, and whether it be a thing ordinary or extraordinary; for in truth I know not what to make of it. If it should prove Antiscorbutick, I hope those will retract their opinion, who deduce the *Scurvy* from the use of Sugar. *Sir*, *Your*, *&c.*

Postscript, *Extracted out of Dr.* Hodgson's *Letter to Dr.* Gilpin.

THe Spirit of *Sugar*, here mentioned, was drawn from bare Sugar-water (which is nothing but the water wherewith the molds, aprons, &c. are washed) fermented with the scum. And it was so exceedingly volatil, that it would not be carried, but lost all its force in the carriage, though it was very well stopped.

An Account of some Books:

I. Roberti Boyle, *Nobilissimi Angli & Soc. Regiæ dignissimi Socii*, *OPERA VARIA*; Genevæ, *in* 4°. 1677.

THe Works of this Noble Author having been already given an Accompt of in these *Transactions*, at the several times when they came abroad singly; the Publisher, upon the looking over

over of this *Latin* Edition, shall only inform the Reader; 1. That this Edition hath been put out without the consent and knowledg of the Author. 2. That the year in the Frontispiece thereof is one and the same, as if the several Books contained in this Latin Volume had been published in one year: and that the Enumeration of the several Treatises, made in the Catalogue of this Lat. Edition, is not according to the time, wherein they were first printed. For, the *first* of the Books mention'd in the said Catalogue was publish'd in English *A.* 1660; the *fifth* and *sixth*, *A.* 1661; the *second*, *A.* 1662; the *seventh*, *A.* 1664; the *fourth*, *A.* 1666; the *third*, *A.* 1670; the *eighth*, *A.* 1671; the *tenth*, *A.* 1672; the *ninth*, *A.* 1673. So preposterously are those Books ranged in this Catalogue and Volum: Which the Reader was to be inform'd of, that by comparing the several true *Dates* of the first Edition of this Authors works with the Books of others, since printed, the priority of the Experiments, and Considerations, respectively contained in them, may be truly stated. 3. That there is no mention made in the General Title, nor in any Advertisement, that these Books are all of them Translations out of English, in which Tongue the Author hath written them all. 4. That the book of the *Origin of Forms and Qualities*, and that of *Subordinate Forms*, are both omitted in this *Volume*, though they were printed, even in Latin, at *Oxford* ever since the year 1669; as they had been printed in *English*, *A.* 1667.

II. *An Account of several Travels through a great part of* GERMANY *in four Journeys, &c. By* Edw. Brown, *M. D. Fellow of the Coll. of Physic. of* London, *and of the* R. Society. Lond. 1677. *in* 4°.

THis Learned and curious Author, having given us a relation of some remoter and seldom-travelled Countries of *Europe* in the year 1673; doth in this piece disengage himself of the promise, he made in the said Relation, of giving an account of *Vienna*; describing withal his Journey unto that place from *England*, by the *Belgick Provinces* and *Germany*; as also his Return from *Vienna*, by *Austria Trans-Danubiana*, *Moravia*, *Bohemia*, *Misnia*. *Saxonia*, unto *Hamburg*; therein giving chiefly an account of the Natural, Artificial and Topographical Observables; together with some Customes and Occurrences, which might be acceptable to the Inquisitive Reader, or serve as hints of further Inquiry, to such persons as may hereafter travel into those Parts.

We shall here take notice only of a few of those Observations, that are mention'd in this book: As, of *Lymphatick* vessels so

preserv'd, as to see *valves* in them; of so great a number of Unicorns-horns (horns of a Sea-animal,) as that a magnificent Throne was built out of them in *Denmark*; of some of those horns, of 10, and of others, of 15 foot long; of a Vessel at *Heidelberg*, holding about 200 Tuns, and, instead of hoops, being built with large Knee-timber like the ribs of a ship; and having, upon one side of it a handsom Stair-case to ascend to the top of the vessel, upon which top there is a Gallery, set round with baliſtres, 43 steps high from the ground; of a large rough *Jaspis*-stone, lying in one of the Courts of the Emperors Palace at *Vienna*, about 9 foot diameter, dug out of a Quarry of *Saltzburg*; of a fair Manuscript of *Ptolomy*, with the Maps drawn in colours; the oldest MS. and true Exemplar of *Livy*, without distinction of Words or Sentences; an old fair Greek MS. of *Dioscorides*, written 1100 years since; these three rare Books, and many more are in the Imperial Library: Of a Knife swallow'd by a Peasant near *Prague*, which was 9 months in his stomach, and then safely cut out: Of some Silver-Mines near *Guttemberg* in *Bohemia*, which are affirm'd to have been wrought 700 years; the Oar of them containing both Silver and Copper, and a *blew Earth*, which they meet with in digging, affording the best hopes of Oar: Of the Elector of *Saxony*'s Repository, furnished with very many and considerable rarities both of Nature and Art; among which, there are two large pieces of pure *Virgin-gold*, as it came out of the Mine, and a *Gun* shooting off 40 times without charging again: Of a Mine, call'd *Himmelfurst*, near *Fryberg* in *Misnia*, wherein hath been found Oar so rich, as in an 100 pounds weight to contain an 130 marks of *Silver*, that is, 65 pounds in the 100: The richest Veins observed to be thinnest: Of a *Sulphur-oar*, some of which contains *Silver*, some *Copper*, and some both, in a small proportion: Of the *German*-manner of making *Brass* with *Lapis calaminaris*; and of a very considerable Mine of this *Lapis* near *Aquisgran*, which is said to have been wrought 300 years, together with a full description thereof, &c.

III. Caspari Bartholini, *Thomæ filii*, *Diaphragmatis structura nova*, *unà cum Methodo præparandi Viscera*, *&c.* Parisiis 1676. *in* 8o.

THe ingenious Author, having, in his Preface, declared his resolution only to consult Nature her self, and acquiesce in nothing but Experiment, which he thinks too many of the great professors of Anatomy have neglected to do; begins in the Tract it self, with shewing, that the lapses of Authors both ancient and modern

modern, which are many, proceed from want of a due consideration both of the true entire fabrick of the parts, and also of their consent with one another, either by their connexion, or contents; many of them, from a light observation of a few circumstances, running presently to analogies.

To which purpose he instances, *first*, in the known distinction between principal and subservient parts; then, in the mistaken notion, as he supposes, about musculous flesh; he allowing nothing to be called flesh, but what is fibrous, soft, and contractile: And to other soft, but not fibrous, substances, which lie about the vessels of the *viscera*, &c. he leaves the usual name of a *parenchyma*; and asserting, with his famous Tutor *Steno*, that all the solid parts of our bodies, except the *parenchymata*, are nothing else but a texture of the same kind of fibres variously diversified; affirming, particularly, of bones (after *Steno*,) That they were first fluid, then tendinous, afterward cartilagineous, and lastly came by degrees to have their hardness and solidity. From hence he infers, that there are no similar parts but fibres, and the substance affused about them; since all parts, according to him, are resoluble into them: Which he endeavours to make out from the consideration of some of the more observable constituent parts and integuments of the body; laying down all as preliminary to demonstrate, that not only the Diaphragm, but all parts of the body, both solid and fluid, are moved by Motive fibres. Here he gives the definition of a *Motive fibre*, delivered by *Steno*, and positively affirms, that that motion belongs only to carneous fibres (whatsoever colour they are endued with, for he thinks redness is not essential to a carneous fiber as such) and takes both tendons, and bones, to owe their motion to those fibres; but believes both membranes and glandules insufficient for motion, which he also denies to the substance of the Brain.

From hence he descends to consider the structure of the *Diaphragm*; where first he taxes former Anatomists, both for affirming it to be one single muscle, and also for teaching, that the *Oesophagus* passes through the membranous parts of it; whereas he affirms, it passes through the carneous; declaring it to consist of two muscles; whereof the upper, at one of its extremities, adheres circularly to the ribs, at the other, passes into an *aponeurosis*, which makes the nervous center (so called) of the Diaphragm: The lower, *he says*, arises from the *vertebræ* of the loyns, and ends in the same *aponeurosis*, neither proceeding from, nor having commerce with, the other, but by that *aponeurosis* asserting withal, that the two appendices of it are made up of several tendons, terminated in the several *vertebræ*; that each of these muscles has peculiar vessels; and that the fibres of the upper part of the lower muscle are somewhat circular, both to make way for the *œsophagus*, and to constringe it; describing withal the site of the fibres, and shewing the difference between the fabrick of this part in men, and some brutes; observing also, that there is, on both sides, a continuation be-

tween some tendons of the upper of these muscles, and the transverse one of the *abdomen*; from whence he makes an ingenious supposition of a *trigastrick muscle*, as if it were (in each side) only one, made up of those two of the *diaphragm* and that of the *abdomen*, one of whose tendons is *fixed* to the *vertebræ* of the loyns, and the other in the *linea alba*: From which connexion of muscles, in that supposition, he assigns the reason of the dilatation, and contraction of the *thorax* in Respiration. The probability of this notion he confirms, from the expansion of the transverse muscles over the *sacculi membranacei* of Birds, which he describes minutely, and renders a reason of their respiration, ascribing nevertheless the motion of those membranes not only to the muscles of the belly, but much to their proper carneous fibres.

This done, he considers the chief office of the Diaphragm, *viz.* Respiration; which he defines to be, A passive motion of the lungs, whereby, upon the dilatation, or contraction and straitning, of the *thorax*, they admit and expel the air, for the cooling the bloud, and perpetuating its motion. And takes notice of two distinctions, one of *Galen*, who makes Respiration to be threefold, 1. *gentle*, from the bare motion of the Diaphragm; 2. *stronger*, from the concurrence of the intercostal muscles; 3. *lofty*, wherewithal the muscles of the *thorax* are concerned: Another of the Honourable Mr. *Boyle*, who makes but two branches of his distinction, one moderate from the Diaphragm, another quicker from the intercostal muscles. Then, against *Helmont*, *Falcoburgius*, *Cartesius*, &c. he asserts that the lungs have some motion of their own, from the carneous fibres of the *trachæa*; affirming, that though the semicircular cartilages of it are said, by the Learned *Diemerbrock*, to be continued by membranes; yet that those reputed membranes consist of carneous fibres, and that they are transversly carried from one side of the cartilage to another: Withal he supposes, that the fabrick of these cartilages is the same within the lungs, and that they have these continued either by carneous fibres, or some that are analogous to carneous; upon the constriction of which cartilages (the motion of the breast concurring,) the air, according to him, is expelled, and room made for the admission of the bloud from the heart, which upon their dilatation, and the readmission of air, is again extruded. Then, resuming his disquisition about the motion of the Diaphragm, having considered what others say concerning its ascent and descent, he concludes, that, when upon inspiration 'tis compressed into the *abdomen*, the *thorax* is raised, but in expiration being propelled upwards, it draws the breast, the breast presses the included air, this the surface of the lungs, whereby the air contained in the *vesiculæ* is expressed into the branches of the *trachææ*, and at last by them driven forth.

Next, he endeavours to prove, that the motion of all the Humors as well as Solid parts, is due to motive fibres: Where first he ranks all the vessels in the body (which contain the humors) under two heads,

viz.

viz. The channel of the aliments, and the sanguineous receptacle; considering in both, *first*, their aptitude, both to conserve their respective humor before a secretion be made, and afterwards to receive other secreted humors; *secondly*, their construction in order to the several secretions to be made out of it; and reducing the several excretory vessels to their due classes; asserting withal, that all humors are secreted only by the mediation of peculiar strainers, which he takes every where to be glandules. Then, as to the motion of the humors, he will allow it to be only twofold; the *first*, Intestine, from whence their fluidity springs; the *other*, Translative, of a mass of them: Where he endeavours to refute the Learned Dr *Thrustons* tripartite division. This latter motion, which he terms their External, he ascribes to motive fibres, which he proceeds to demonstrate in both the kinds of vessels before named.

And first in his Channel of aliments, having again premised his distinction of its contents, into what is assumed by the mouth, and not yet altered, and what is secreted out of the bloud, and mixed with that, in order to produce some alteration in it, he proposes to consider what influence the motive fibres of all the parts of it, whether they be concerned before or after secretion, have upon the humors belonging to it; and instances, *first* in the *Tongue*, whose use (after *Steno*) he thinks to be not so much for speech, as in order to the subaction and detrusion of the aliments; then in the *œsophagus*, which by means of its spiral fibres seems adapted to continue the motion begun by the tongue; next in the *Diaphragm*, through the carneous fibres of the lower muscle of which (according to his former assertion) the *œsophagus* passing, he supposes to be by that means further constringed: Where he endeavours to give an account of the *dyspnœa*, and such like affects, and also of the *singultus*, and obviates an objection that might be made, from the consideration of Birds, in which there is no such compression of the orifice from the diaphragm, by alledging, that the defect of it is supplied, first, by the carneous fibres of the Craw (described, *he says*, by *Steno*) before the entrance of the meat into the stomach; then by the strong muscles of their stomach, together with the assistance of the little stones they swallow, which help to grind the meat there. Then he further considers, that by the help of the parts concerned in respiration, the exclusion of the aliments out of the stomach is assisted, and their protrusion farther continu'd; to promote which along the tracts of the intestines, and to cause a segregation of the purer parts of the chyle into the *vasa lactea*, the peristaltick motion yields its assistance. Where he takes occasion to vindicate his fathers doctrine about the Funeral of the Liver against the learned *Swammerdam*. Lastly he takes notice, that the chyle, once got into its receptacle, is, with the *lympha*, impelled up the *ductus thoracicus* into the bloud, by means of the tendons of the Diaphragm, and pulsation of the intercostal arteries, between which the *ductus* lies.

In

In the sanguineous receptacle he likewise considers two kinds of contents, one whereof is the *Chyle*, which by various cribrations and circulations, at last comes to constitute the whole mass of bloud; the other, the *Lympha*, which, having been secreted from it, is afterwards refunded to it. And, to explain how the motion, both of the whole mass of bloud, and of the humors, to be secreted from it, depends upon the carneous fibres, he supposes a channel without beginning or end, from one part of which he supposes other channels to branch, and to return again circularly into it; all the branches in the mean while observing a proportion to that part of it, from whence he begins the division (describing it by two figures;) which he applies to the several parts, and the motion of the liquors through them. After which he undertakes to confute the opinion of some that think the Humours, by their effervescence, have a great hand in the contraction and dilatation of the heart, ascribing the business wholly to the motive fibres of that muscle. Then he touches upon the opinion of some, that the Arteries have a peristaltick contraction, but forbears to determine it: Only, seems to like Dr *Thruston*'s conjecture, about the *Systaltick* motion of the circumjacent parts, for returning the bloud along the veins to the heart; but adds, that it might with more probability be said, that the return of it by the veins, is not only from the propulsion of that which comes out of the arteries into them, but from the proximity of those two kinds of vessels, and the mediation of their coats; the dilatation of the arteries, in regard they all along joyn laterally to the veins, helping the protrusion of the bloud from valve to valve toward the heart: And though they are separated in the lungs by the *bronchia*, yet the air upon inspiration (according to *Thrustons* ingenious supposition) does, he imagines, the same thing. Lastly, to confirm his assertion about motive fibres being the cause of this motion of the Humours, he cites *Malpighius*'s observation, about the *cellulæ* of the spleen, where, because there is not a sufficient compression, the affused blood does, after a sort, stagnate.

From hence he proceeds to consider the Excretory vessels of this Receptacle. Among which, in the first place he reckons the Nerves, but leaves their farther consideration as too obscure: Next the Lymphaticks, which (after others) he will have to arise from conglobated glandules. Of these vessels he affirms many to be in the Spleen, and shews his way to make them appear to view; He seems also to own some of them in the Liver, though *Malpighius* doubt of them; offers to shew those of the Kidneys to any that desire it; will not determine any thing concerning those, which *Swammerdam* supposes to proceed from the glandules of the intestines, if they are distinct from the *vasa lactea*, which he alledges he has once or twice found full of clear *lympha*, when he has opened the animal two hours after meat; but declares that *he* has discovered, (at least affirms, that he has not met with the same observation made by any other,) and in several subjects constantly

ſtantly found, ſome very large excretory lymphaticks, proceeding from the glandules of the Meſentery; and terminated in the receptacle of chyle, in the ſame manner as the trunk of the lymphaticks uſes; which new veſſels, *he ſays*, are, after and before the time of the diſtribution of the aliments, filled with *Lympha*; only declares himſelf not ſatisfied, whether they are ſucceſſively filled with chyle and *lympha*, as the receptacle and thoracick *ductus* are: On the occaſion of which diſcovery he urges ſeveral conſiderable doubts about the paſſage of the chyle into the receptacle, the *lympha*, and conglobated glandules (to be found in the book it ſelf:) Then conſiders, whence the *lympha* is derived, and concludes it to proceed not from the animal ſpirits, but the bloud; yet nevertheleſs ſuppoſes not any immediate *anaſtomoſis* between the arteries and lymphaticks, but only that they have a communication by means of their ſtrainers or ſome other parts of the body. The motion of this *lympha*, he (after his father) affirms to be from the circumference toward the center of the body; but think no body has aſſigned the cauſe of that motion, which therefore he attributes to a propulſion from the heart, which by means of its motive fibres continually propelling, with the bloud, the matter to be ſecreted, (*and the bloud as inceſſantly depoſiting ſome of this matter by means of the ſtrainers into theſe veſſels,*) this muſt conſtantly propel the former, to make way for it ſelf; adding withal, that in regard theſe veſſels are frequently wrapped about the veins, the motion of the bloud along them may, by compreſſing the lymphaticks, accelerate the motion of their liquor.

From the ſame cauſe, *viz.* Motive fibres, he ſuppoſes the liquor of the conglomerated glandules may be diſcharged by their veſſels. In which parts yet he conceives Natures Art is very remarkable; and inſtances in the *parotis conglomerata*, the glandules of the cheeks, thoſe of the palate, and the glandules of the *æſophagus* in Fowl; all which undergo a great compreſſion, either from conſiderable muſcles, papillary bodies, or cartilages, in order to a copious diſcharge of their liquor. As to the *ſuccus pancreaticus*, and *bile*, he believes their excretion to be promoted by the compreſſion of the muſcles of the *abdomen*, and the motion of the diaphragm, according to *Malpighius*'s opinion; and takes occaſion to examine Dr. *Cole*'s conjecture, about the way that he ſuppoſes the *veſicula fellis* may (perhaps) receive its liquor. Then mentions, and deſcribes, a certain conglomerated glandule (lately diſcovered by *Joſephus de Verney*) in Cows, at the ſide of the *vulva*, which he takes to ſupply the room of the *proſtata*, and to excrete ſome liquor, *coitus tempore*; to which purpoſe, he ſays, 'tis inveſted with carneous fibres; and concludes with examining the Learned *Graeff*'s aſſertion about ſome other glandules in the neck of the womb.

Having finiſhed the Treatiſe, to oblige the Curious, our Author ſubjoyns a Diſcourſe about His way of preparing the *Viſcera*; concerning which, as to the preparation, contrivance, and uſe thereof, the Reader is deſired to peruſe the Account it ſelf there given.

IV. *Longitude*

IV. *Longitude found, by* Henry Bond *Senior, Teacher of the Mathematicks.* London 1676. *in* 4°.

THe Attempt and Pains of the Author of this Book are certainly very commendable, forasmuch as he endeavours to explain to us the *Use* of the *Inclinatory Needle*, and in so doing makes it known to the world, that, as both the *Variation* and *Inclination* of the Needle were found out first of all in this Nation by two *English* men, Mr. *Robert Norman* and Mr. *William Burrows*; so he (our Author) hath now made it his business to apply it to an Use, formerly, for ought we know, not thought of, *viz.* To *find the Longitude.* Which how he performs and makes good, is left to the Sagacious Reader to judge.

Mean time, the Publisher is desired, here to take notice of a mistake committed in this Book, *viz.* in the page printed next after the Epistle to the Reader; where 'tis said, that *This Treatise hath been examin'd by* six *Commissioners appointed by the King, and* the Truth of it *affirmed to his Majesty:* Whereas of the six persons there named, the Right Honourable the Lord Viscount *Brouncker*, Chancellour to her Majesty, and President to the R. Society, declareth, that he never so much as saw this Treatise before it was printed, nor was ever present at any of the Meetings of the other Commissioners; the Quality of the report of whom concerning this matter the Reader will doubtless be acquainted with in due time.

V. The Royal Almanack: *By* N. Stephenson, *one of his Majesties Gunners.* London 1677. *in* 12°.

THis Almanack is a very useful Diary of the true places of the Sun, Moon, and other Planets; their Rising, Southing, and Setting; as also of High-water at *London-bridge*, with Rules to serve other places after the *New Theory* of Tides, and Directions of Sir *Jonas Moore.* To which are added the *Eclipses*, with a Table of Equations for the regulating curious *Pendulum-Clocks*, and Movements to the Sun: Likewise, a Table of the Suns right Ascension in time for every day at Noon, and of Thirty of the most notable Fixed Stars: Together with the Moons and the other Planets Appulses to the Fixed Stars, for the Meridian of *London*, in the year 1677; as also a *Transit* of *Mercury* under the Sun, calculated for *Octob.* 28. next. All done with great care and pains at his Majesties command.

Errat. p. 766. l. 14 & 15. r. *Icicles*; ibid. l. 22. r. *the Consideration.*

Imprimatur,

Decemb. 14. 1676. *BROUNCKER*, P. R. S.

London, *Printed for* John Martyn, *Printer to the* R. Society, 1676.

PHILOSOPHICAL TRANSACTIONS.

Januar. 29. 1676.

The CONTENTS.

New Experiments made and communicated by the Honourable Robert Boyle *Esquire, about the Superficial Figures of Fluids, especially of Liquors contiguous to other Liquors: likely to conduce much to the Physical Theory of the Grand System of the World. An Extract of a Letter written to the Publisher, concerning a factitious Stony matter or Paste, shining in the dark like a glowing Coal, after it hath been a little while exposed to the Day- or Candle-light. An Account of three Books:* I. *CLAVIS PHILOSOPHIÆ NATURALIS,* Aristotelica Cartesiana, *Editio secunda, aucta Opusculis Philosophicis varii argumenti; Auth.* Johanne de Raei, *&c. Anno* 1677. *in* 4o. II. *NOUVELLE SCIENCE DES TEMPS, ou Moyen general de concilier les Chronologues; par le S.* Menard; *à* Paris *in* 12o. III. *ENGLANDS IMPROVEMENT by Sea and Land, &c. By* Andrew Yarranton *Gentl.* London, 1677. *in* 4o.

New Experiments made and communicated by the Honourable Robert Boyle *Esquire; about the Superficial Figures of Fluids, especially of Liquors contiguous to other Liquors.*

SIR,

IN compliance with your Curiosity, I herewith send you my rude Notes about the Superficial Figures of contiguous Liquors, which, belonging to a Paper (concerning the *Pores* and *Figures* of *Bodies*,) whereof they made the last part, and being themselves very indigested; I should by no means venture to expose them even to a less Critical eye than yours, if I did not hope, that, though a more discerning Reader will sooner discover their Imperfections, yet he may be more inclin'd than an ordinary one would be to think them not useless Trifles; since, if these Trials and Hints, as mean as they are, be prosecuted by Naturalists that have Mathemat cal Heads, per-

haps they may conduce more to the *Physical Theory* of the Grand *System of the World*, than at first one would suspect. And that I may leave you and your Ingenious Friends the greater opportunity and freedom to exercise their Sagacity on these *Phænomena*, I have purposely forborn to engage in Speculative Discourses upon them, contenting my self to have faithfully recited Matter of fact, and thereby to have sprung game for those that have more leisure and hability to flie at it.

—What has been said about the *Pores* of *Liquors*, may be somewhat illustrated or confirm'd, if I subjoyn to it some of the Trials I have made about the *Surfaces of Fluids contiguous to other Fluids*. For this being, for ought I know, a neglected Subject, and the little that has been taken notice of about it, consisting of a few slight and casual Observations, that seem to have been rather presented to us, not to say obtruded upon us, than designedly made by us; I many years ago thought, it might be worth while to spend some hours upon Experiments of this sort: Which I was especially induc'd to do, because I think, one may probably enough suppose, that in the Tract of the Universe that is yet known to us, there is not the hundredth, perhaps not the thousandth, part, that is form'd into *Solid* Bodies, such as the Earth, the Moon, and the other Planets; and consequently all the rest is made up of Celestial Fluids and the Atmospheres of Solid Globes, which, for ought we know, though not manifestly differing in transparency, may be disterminated by distinct Surfaces. So that, to observe and consider the effects of the congruity and incongruity, that Liquors, or such fluid Bodies, as directly or otherwise fall under sensible Observation, have, when they are contiguous to one another, or to the surfaces of Solid Bodies, may not only improve what is yet known about the Ascension of Liquors in small Pipes, but may perchance serve to illustrate the formation of those great Masses of Matter, of which the Divine Architect has fram'd the Mundane Globes, and some other considerable parts of the Universe, especially if we admit the *Cartesian* Hypothesis, *That the Sun, and all the Fixt Stars are Fluid Bodies.*

The Cause, why Water in narrow Pipes ascends above the level of the surrounding water, having been already enquired into by some Ingenious men, and particularly by Mr. *Hooke*, I shall

ſhall not now diſcourſe of that Subject, nor ſo much as mention what I have tried about it; but ſhall rather take notice, that, becauſe I ſuſpected, that the Concave Figure, which may be obſerved in the ſurface of Water included in ſlender pipes, may, at leaſt in great part, depend upon its relation to the Contiguous fluid, which, in ordinary caſes, is the *Air*;

I thought fit to try whether this Concave Figure would not be altered by ſubſtituting another Liquor in the room of the Air: And accordingly having procured a ſtrongly *Alcalizat Menſtruum* (I uſed that made of fixt Niter, diſſolved by the moiſture of a Cellar) into a pipe of glaſs, ſeal'd at one end, and not full a quarter of an Inch in bore; that the Cavity, which in a greater breadth would ſeem leſs deep, might be the more conſpicuous: We gently poured on it ſome highly dephlegm'd *Spirit of Wine*, which we knew would not mix with it, but ſwim above it, and preſently, as we had gueſs'd, we found the Figure of the ſurface of the lower Liquor changed, and the cavity quite deſtroyed; the ſurface that ſeemed, as it were, common to the two contiguous Liquors, appearing flat or horizontal. And ſuch a level Superficies we had, by putting thoſe two Liquors together in a much wider Glaſs. Exp. I.

We found alſo, that by employing *Oyl of Turpentine* inſtead of Spirit of Wine, the Liquor did almoſt totally loſe its Cavity. Exp. II.

But if, inſtead of deliquated Tartar, we put common water into the Pipe, we found this Liquor to retain its Concave Surface, though we put to it ſome Oyl of Turpentine and left it to reſt upon the water a good while. Exp. III.

In regard that, when Oil and Water are put together, the Oil that has been employed to produce the *Phænomena*, wont to be afforded by their Contact, has uſually been *common* Oil, as that of Olives, which is lighter than water; I thought it expedient to try what Figures would be afforded by the Surface of water and alſo by that of Air, when thoſe Fluids ſhould become contiguous to an Oil, heavier than water: of which ſort Chymiſtry had afforded me more than one or two beſides the Eſſential oils of Cloves and Cinamon: Having therefore provided ſome pure oil of the *Gum of Guajacum*, and poured a little of it into a Exp. IV.

ſlender pipe, we found the upper *ſuperficies* of it to be concave; almoſt, if not altogether, like that which water would have had in the ſame pipe. But when I put a little Water upon this Oil, it preſently changed the figure of its ſurface, which became viſibly, though not very much, protuberant or Convex.

Exp. V. And in regard this Oil, though heavier than Water, is not ſo heavy as deliquated Salt of *Tartar*, I thought fit to try, whether the *Phænomenon* would not be differing upon the Contact of thoſe two liquors; and accordingly having put ſome Oil of *Tartar* into the ſlender pipe, and put ſome drops of the Oil of *Guajacum* to it, we found, that this liquor did not manifeſtly alter the Concave figure of the ſurface of the liquor *Alcali*, as the Oil of *Turpentine* had done: And having, for Curioſity ſake, warily poured a little Water upon the Oil of *Guajacum*, I found, as I had reaſon to ſuſpect, that the upper *Superficies* of it changed preſently from a Concave Figure to a Convex, ſo that this Oil in the midſt of the other two liquors appear'd like a little red Cylinder, which, inſtead of having Circular *baſes*, was protuberant at both ends, but more at that which touched the Oil of *Tartar*.

Exp. VI. To vary a little the Experiment, I put ſome *Eſſential Oil* (as Chymiſts call it) of *Cloves* into a new ſlender pipe, and having obſerved it to be ſomewhat Concave at the top where it was contiguous to the Air, we cauſed a little Common water (perhaps a quarter of a ſpoonful or leſs) to be put to it, and found, as we expected, the ſurface of this Oil alſo to become tumid. And in regard this Liquor as well as the forementioned Oil of *Guajacum*, though it were ſo heavy as to ſink in water, would not do ſo in deliquated Salt of *Tartar*, we did, into another ſlender pipe, put firſt ſome of this laſt nam'd liquor, then ſome of the Aromatic Oil, and laſtly a little Common water; by which means we found, that the little Cylinder of Oil did, like that of the Oil of *Guajacum*, appear convex at both ends; but was unlike it in one Circumſtance, that the Oil of *Cloves* appear'd more convex at the upper end where 'twas contiguous to the water, than at the lower, that lean'd upon the ſurface of the Oil of *Tartar*.

Having

Having made these Trials, to alter, by another contiguous fluid than the Air, the Concave *superficies* of Water and some Aqueous liquors, I proceeded to try, whether a change would not likewise be made on the convex figure of the surface of *Quicksilver* included in the like slender Glasses; and accordingly, having taken one that was much longer, but of the like bore with the former (for to make the Trials more uniform, I had caused a long Pipe to be by the flame of a Lamp unequally divided into several short ones) we put into it a small quantity of Quicksilver, and having taken notice how the upper *superficies* swelled in the middle above the level of the parts where it touched the Glass, we poured some Water upon it, and found a manifest and considerable depression of the Surface, though the protuberance were not quite suppressed. Exp. VII.

This *Phænomenon* having been for greater security several times repeated, I thought fit to try, what variation would be made, by the greater or lesser height of the water incumbent on the *Mercury*. And sometimes it seem'd, that, when the aqueous Cylinder was much longer, the depression of the *Mercurial* surface was somewhat greater. But this did not so constantly happen: But we often observ'd, that, though a very little Water sufficed by its contact to make, in the judgment of the eye, a manifest abatement of the Protuberance of the Quicksilver, yet it had not the same effect on that ponderous Fluid, that it had, when, being increased almost as high as the length of the Pipe would permit, a greater weight of it was incumbent on the *Mercury*. For then I manifestly perceived and shew'd to others, that the surface of the Quicksilver being depress'd almost to a Level in those parts of it that were near the inside of the Glass, there was about the middle of the surface an elevation of *Mercurial* matter, that appear'd to be rather more than a half Globe, and was to the height of its full *Semidiameter*, raised above the rest of the *Mercurial* surface, and in that state it continued as long as I thought fit to let it do so. And lest this Tryal should impose upon me, I caused it to be more than once repeated; and, the better to confirm it, I afterwards caused the incumbent Water to be little by little suckt up, and found, as I expected, that when the Incumbent water began to be Exp. VIII.

too

too much shorten'd, the little Teat or Segment of sphere, lately mention'd, began to be somewhat flatten'd, and subsided more and more as the Water was further taken off.

Exp. IX. Because the common *Atmospherical* Air we breath is a Fluid body abounding with grosser particles, and is by divers Philosophers probably supposed to be much more dense and heavy than the *Æthereal* substance, that makes the other part of the Atmosphere; I thought fit to try for their sakes, whether or no the *superficial* Figure of Liquors would be alter'd by having the contiguous Air withdrawn from about them, and so being left to be touch'd by the purer Æther without it; and accordingly having conveyed into one of our *Pneumatical Receivers* a couple of such Slender pipes as have been already described, one of them furnish'd with Common water, and the other with Quicksilver, we caused the Common air to be diligently pump'd out, without observing any sensible change in the Concave Figure of the water: but as for the Quicksilver, I knew not what to conclude about it. For having repeated the Trial twice or thrice, the *Mercury* sometimes seem'd manifestly to swell to be more protuberant upon the Exhaustion of the Receiver, than when it was put in, especially when its Figure was attentively view'd, and the External air, that was pumpt out but slowly, was suffered to reenter with all convenient celerity. But that which yet kept me doubtful was, that I observed, that upon the diligent withdrawing of the Airs pressure on the Quicksilver, there disclosed themselves in it some little bubbles, which I fear'd we had not been able to free it altogether from, and which might be suspected to have some interest in the *Phænomenon*; which though it was at that time hinder'd by some occasions from prosecuting further, yet I think it may be well worth the while, because, if any sensible change do certainly appear to be made in the Superficial figure of the *Mercury*, it may teach us somewhat relating to the Constitution of the Æther, which seems to make up far the greater part of the Universe known to us: And I should not in that case think it impossible, that by exposing many and differing Liquors to its Contact *in vacuo Boyliano* (as 'tis call'd) some discovery may be made of differing Substances, whereof one may suspect the Æther it self not to be uncapable. But to leave suspicions that probably

bably will be thought Chimerical, I ſhall only add, which I forgot before, that we conveyed into our *Receiver* a clear Chymical Oil that was heavier than Water, and, whilſt 'twas contiguous to it, had not a Concave but a Convex ſurface, and having placed the Pipe furniſh'd with both Liquors in the *Pneumatical Receiver*, we pumpt out the Air without finding that the Oil ſenſibly altered its Protuberant Surface, as neither did the Water loſe the Concave figure of its upper ſurface.

When Clouds are condens'd into Rain, and lower aggregates of vapors into Dew, 'tis ſuppoſed to be obvious, that the drops of thoſe Meteors do, in their paſſage through the Air, (which to them is a heterogeneous Fluid) acquire a round figure; and when we ſhake Oil into Water, the portions of the former fluid, during the little time they remain diſtinct (for they quickly reunite into maſſes) are found to be globular. But theſe *Phænomena* are too few and too tranſient to afford any conſiderable Obſervation of the Figures of Fluid bodies, eſpecially if they be quieſcent, and every way encompaſs'd by other Fluids. Wherefore I thought fit to try what I could do with Chymical Liquors unapt for mingling, to produce *Phænomena* that may laſt long enough to allow Us to obſerve them attentively, and in ſome caſes to vary them.

For this purpoſe, I firſt took fixt *Niter*, (or, which is analogous to it, Salt of *Tartar*) reſolved *per Deliquium* into a tranſparent Liquor, and having fill'd a clear Vial half full with this, I poured on it a convenient quantity of Vinous ſpirit exactly rectified, that there might be no Phlegm to occaſion an union between the two Liquors, which ought, as ours did, to retain diſtinct *ſurfaces*, and ſpeedily regain them though the Glaſs were well ſhaken. Then having found by a Trial formerly mention'd, that common Oil of *Turpentine*, if employed in a competent quantity, will not totally (and much leſs will readily) diſſolve in Spirit of Wine, and alſo having obſerv'd (what may ſeem ſomewhat ſtrange) that if this Spirit of Wine be exquiſitely dephlegm'd, the Oil, though a Chymical one, will not ſwim on it, but ſink in it; I warily let fall ſome drops of the Oil into the Spirit, Exp. X.

and

and had the pleasure to see, as I expected, that they fell towards the bottom of the Glass till their descent was stopt by the horizontal (for it was not concave) surface of the *Alcalizat* liquor of fixt *Niter*. And because my design was chiefly to observe the superficial Figure of a Fluid encompassed by other Fluids without touching any solid body, I shall here take notice of the chief *Phænomena* that were produc'd of that kind, without staying to enquire into the *Causes* or the *Consequences* of them.

1. If the Oily drops were but small, they seem'd to the Eye exactly enough spherical. For the Oil differing but very little in specific Gravity from the Spirit of Wine, the drops did but just touch the surface of the subjacent *Alcali*; and the same drops being but small, their own weight was not great enough visibly to depress them, and hinder that roundness which the pressure of the Ambient Spirit, or their own Viscosity endeavour'd to give them.

2. If an Aggregate of drops were considerably bigger than those newly mention'd, as if it had about a third part of an Inch in Diameter, it would then manifestly lean upon the *Alcalizat* liquor as upon a floor, and appear *somewhat* elliptical, (for some little part of the bottom was a Plain;) the weight of the upper parts depressing the drops, and making the horizontal Diameter somewhat longer than the transverse.

3. If a yet greater portion of Oil were let fall upon the heavy Liquor, it would for a pretty while appear in the form of a somewhat imperfect Hemisphere, or some other large section of a Sphere, the lower part being cut off; (as if a Globe were divided by a Plain) by the horizontal surface of the deliquated Salt.

4. But if the quantity of Oil were not too great, 'twas pretty to observe, that, though at first putting in, it did perhaps spread it self over the subjacent Liquor, and lie as 'twere flat upon it; yet by little and little, (for 'twas but slowly)

ſlowly) it would by the action of the Ambient, concurring with its own tenacity, be crouded together into a Figure of a leſſer ſurface, and conſequently leſs hindering the motions of the Vinous liquor. For by the action of this Spirit, the Oil would by degrees be raiſed above the ſurface of the fluid *Niter*, and be reduc'd to the Figure, either of half a Globe, or of a greater ſegment of a Globe, or even of an imperfect *Ellipſis*, according as the bulk or weight of the Oil made it more or leſs apt to reſiſt the action of the Ambient ſpirit, to whoſe effect, as I lately intimated, the natural viſcoſity of the Oil might (more or leſs) cooperate, as alſo might the weight of the *Spirit of Wine*, which in great part diſabled the endeavour of the Oils gravity to make its Figure leſs convex.

5. Though theſe Globuls or portions of Oil, did oftentimes readily mingle, when they touched one another, yet divers times alſo we obſerved, that having warily approached them, we were able (as if ſome odd ſubtile matter, that the Eye could not diſcern, interpoſed, to keep them unconfounded;) to make them touch without mingling: Inſomuch, that we have with pleaſure made them ſo far bear againſt one anothers *ſurfaces*, as manifeſtly to preſs them inwards, though being parted they would preſently reſume their former Figure: Which circumſtance ſuggeſted to me Suſpicions, that I cannot now ſtay to name. But in caſe any of theſe Oily portions came by a more preſſing contact to be united, they would then alter the Figures they had whilſt ſeparate, and take another, ſuitable to the bulk of the Aggregate.

6. When a large portion of Oil reſted upon the Saline liquors, if then the Ambient ſpirit were moderately and warily agitated, 'twas not unpleaſant to obſerve the various Figurations, which the convex and protuberant part of the mutilated Globe would be put into by theſe ſhakes, without any viſible ſolution of continuity, or conſiderable motion of the whole body, which would very quickly recover its former Figure. Though, if the agitation were too ſtrong, ſome portions would be quite broken off, and preſently turn'd into little Globes.

Exp. XI. I tried to produce another *Phænomenon*, that would not have been unpleasant, by putting together in a somewhat large Vessel, with other Liquors, two Oils, (whereof one, if I mistake not, was from *Turpentine*,) which first, by reason of the *Oleaginous* nature wherein they agreed, might exactly mingle and make a compounded Liquor; and then, by reason of their being one heavier, and the other lighter *in specie* than Water, might by this Liquor be again separated, and include betwixt them the Liquor that had divided them. But I found, that the *Oils* being once united would not be easily parted, but according to the Prevalency of the lighter or heavier Ingredient, in the mixture, the compounded Oil, would almost totally either emerge to the top of the Water, or lie beneath the bottom of it; I say, almost *totally*, because some parts of the Oil, which was not perhaps all uniformly mixt, did not keep in a body with the rest; but either was separated from the Mass in the form of Globuls, or else, sticking to the side of the Glass, had the other part of its *superficies*, which was contiguous to the Water, very variously figur'd, according as the bulk and degree of Gravity of the adhering Oil and other circumstances happen'd to determine. And 'tis chiefly upon the account of this various and odd Figuration of our mixture, that I here make mention of this Trial; which though it prov'd not successful to me, yet perhaps may succeed in the Hands of another, that shall make it with more leisure and diligence, than I could afford it.

These are some of the *Phænomena* I observ'd in Oil of *Turpentine*, when 'twas inviron'd only with Fluids; but, if it were permitted to be contiguous to the inside of the Glass, and so to fasten part of its surface to a Solid, the greater part of the Surface, which remain'd exposed to one or both of the contiguous Liquors, would, partly by their action, and partly by the gravity of the Oil it self, be put into Figures so various, and sometimes so extravagant, that 'twas much more pleasant to behold them, than it would be easie to describe them; which therefore I shall not here attempt to do.

Whereas

Whereas I intimated in the Preamble to these Notes, that *Confining Fluids* may have distinct Surfaces, without having, at least in many Positions, refractions differing enough, or reflections strong enough, to make the Plain, that disterminates them, obvious to the Eye; I shall here observe, that when the Oil of *Tartar*, or *Nitrous Alcali*, that I employed, happened to be very clear and colourless, I have more than once made highly rectified *Spirit of Wine* float upon it so, that in most Positions the Vial seem'd to have in it but one Uniform Liquor; the Plain that divided the two Fluids being unapt to be discerned, but in a Position, wherein the Rays of Light passing thence to the Eye, fell very obliquely on it; and indeed, when there was no little Dust or other Feculency, swimming upon the *surface* of the Oil of *Tartar*; I had sometimes much ado to convince ordinary Spectators, that the Vial, in two distinct Regions of it, contain'd two unsociable Liquors. Exp. XII.

On this occasion, I shall add an Experiment, which, though it does not so directly belong to our Subject, as to make its Omission a fault, is not yet perhaps so Impertinent as to be unwelcom. Exp. XIII.

We took a deliquated *Alcali*, made of *Niter* and *Tartar*, and deeply ting'd with *Cochaneel*; and, that the Liquors might not only be heterogeneous, but as differing in gravity and density as we could make them, we poured on it a peculiar kind of Oil lighter than *Spirit of Wine*, and holding the Plain where the two Liquors were contiguous in a convenient Position, in respect of the Light and the Eye, I observ'd it to make a strangely vivid Reflection of the incident beams of Light: so that this Physical Surface, which was flat, look't almost, for 'twas not so specular, like that of *Quicksilver*; and when I kept it till Night, and considered it by the Light of a Candle, the bright Figure of the flame was strongly reflected almost as from a close Specular body; which tempted me to suspect, that there might be something else than the bare smoothness of the surface of the *Alcalizat* Liquor to produce so brisk a Reflection; and the rather,

becauſe I did not obſerve, that the Remains of the ſame tinged *Alcali*, which I kept in another Glaſs, nor a portion of the ſame Oil, which I had alſo by me in a ſeparate Vial, did either of them afford ſo vivid a Reflection from its ſurface; though I did the leſs wonder at this, becauſe of the great diſpoſition to reflect Light, which I had formerly the Curioſity to obſerve in the forementioned Oil, when I joyned it with other Liquors. But, whether this ſtrongly Reflecting power, taken notice of in our late recited Experiment, proceeded from ſome mixture, as it were, or confuſion of ſingly unperceived particles in the Phyſical *Superficies* or Plain, where the two Liquors confine; or, whether ſome ſuch *Materia ſubtilis*, or *Æthereal* Fluid, as *Carteſius* and ſome of the Ancients maintained, inſinuated it ſelf between our two Liquors, and made the Diſterminating ſurface more ſpecular; or whether the *Phænomenon* be rather due to ſome other cauſe, I ſhall not now ſtay to make Inquiry: But to help towards it, I ſhall add on this occaſion, that looking on this Liquor, as a body, which, though it have all the neceſſary Qualities of an Oil, does, in regard of its Origin, and ſome properties I have found in it, differ from common Chymical Oils; I was invited the more to obſerve its *Phænomena* in reference to Reflection, and I found, among other Things, (not pertinent to this place,) *Firſt*, That the Confining Plain, often mentioned between the tinged *Alcali* and this Liquor, did not appear Red it ſelf, nor communicate that Colour to the image of the Flame of a Candle reflected from it. *Secondly*, that when I warily ſhook the Vial, which contained the two Liquors, the uppermoſt would be reduced into a ſeeming Froth, conſiſting of a great number of imperfectly Globular bodies, which after a while would make a kind of a rude Phyſical Plain; which, though neither very Horizontal nor ſenſibly ſmooth, would, at its upper *ſuperficies*, ſend back the incident Light with more briskneſs than one would expect; and when the ſeeming Froth conſiſted of ſmaller particles, theſe, when they were of a certain ſize, and conveniently placed, in reference to the Flame of a Candle and the Eye, would, (as more than one Trial informed me,) reflect the Incident Light ſo many waies, and ſo viſibly, that they

they ſeemed, for multitude and ſplendor, like little ſparkling Corpuſcles of poliſhed Silver; or almoſt like thoſe gliſtering ones, that appear, when a clean plate of *Copper* is firſt immerſed into a much allayed ſolution of good *Silver*, made in *Aqua fortis*.

And to theſe two *Phænomena* I ſhall add a *third*, which is, That, though pure *Spirit of Wine* be ſo thin a Liquor, and our *Oil* is nevertheleſs ſo light as to ſwim upon it; yet I found the Confining ſurface very ſtrongly reflexive. But of this Liquor, more perhaps may be ſaid in another place.

And it may, in the mean while, not be impertinent here to intimate to you, That I found, that ſome other *Eſſential Oils* (as Chymiſts call thoſe, that are diſtilled with Water in *Limbecks*) and particularly an unſophiſticated *Oil of Limons*, did, with our tinged *Alcali*, afford moſt of the ſame *Phænomena*; but not ſo brisk a Reflection: I ſay, *moſt*, chiefly becauſe with *Spirit of Wine* theſe ſubtile Oils, as I formerly noted, will readily be confounded: though our *Anomalous Oyl* be unſociable with it.

Extract

Extract of a Letter written to the Publiſher, concerning a Factitious Stony matter or Paſte, ſhining in the dark like a glowing Coal, after it hath been a little while expoſed to the Day- or Candle-light.

Clariſſimo Viro

Domino *Henrico Oldenburgio*, Illuſtriſſimæ Soc. Regiæ Secr.

Salutem & obſervantiam

Chriſtianus Adolphus Balduinus.

—*Quanquam elapſo proximè anno officioſiſſimè ſcriptas tuas literas teſtari continuò debuiſſem quanti facerem, religioni tamen duxi id facere, antequam Phoſphorum meum modis omnibus abſolutum darem conficerémque: Quod cùm non multò ante præſtiterim, ecce Tibi eundem in theca argentea inaurata; quem, ceu munus exiguum, ſi fas ſit petere à Te, humillimâ ſubjectione deferre velis cum ipſi* Regiæ Majeſtati *tanquam Fundatori & Patrono* Societatis Veſtræ, *inprimis; tum verò Ejuſdem Præſidi Illuſtriſſimo, cæteriſque Aſſeſſoribus & Collegis graviſſimis; nihilque intermittere velis, quodcunque vel Clementiæ Regiæ, vel Favori tantorum Virorum conciliando facere arbitreris. Latet in Phoſphoro iſto ignis & luminis Naturæ realis ſcintillula, imò ſecretiſſima anima, proindéque intrinſecus atque inviſibilis Sophorum ignis, viſibilem Solis ignem magneticâ ratione attrahens, ſplendorémque ipſius viciſſim in Tenebris emittens ejaculanſque. Quo iſtud accedit non minùs mirum, Signaturam nempe Solis contineri in Univerſali iſto Magnete unde confectus idem ille Phoſphorus eſt; quod quidem ex adjuncto Schemate Phænomeni* * *(per dies aliquot durante) liquidiſſimè patet.*

* Hoc phænomenon repræſentat in vaſe vitreo complures imagines Solis, majores, minores; in quas materia, ab Authore noſtro adhibita, jucundiſſimo, ut videtur, ſpectaculo, abiiſſe conſpecta fuit.

Atque

Atque inde non eſt, quod ſubjecto iſto uti deſiſtam in Chymicis meis laboribus continuandis, quòd multò majora mihi propediem dignioráque ex ſe ſpondeat, quorumque magis arcana ratio. De quibus omnibus, philoſophicâ conſuetudine, Societati Illuſtriſſimæ relaturus per literas ſum quæcunque certis Experimentis comperero. Servet te Deus, & me porrò affectu tuo complectere. Scrib. Haynæ, *d.* 1. Sept. 1676.

THis Preſent being, according to the tenour of this Letter, preſented to his *Majeſty*, and afterwards to the *R. Society*, it fully juſtified the generous Preſenter in the Experiment, made before them both, at ſeveral times; and that not only by Day-light, even when the Weather was gloomy and miſty, but alſo by the Flame of a Candle. And 'tis hoped, that the ſaid Preſenter will ſo far extend his generoſity, when he ſhall underſtand the gracious acceptance his Preſent had with the Royal Founder of our Philoſophical Company, and the pleaſure, it gave to the Gentlemen that compoſe it, as to impart to them the way of preparing the ſame; to be Recorded in their Regiſter books, as a perpetual Monument of his ingeniоſity and frankneſs.

An Account of three Books:

I. *CLAVIS PHILOSOPHIÆ NATURALIS*, Ariſtotelica Carteſiana, *Editio ſecunda, aucta Opuſculis Philoſophicis varii argumenti; quibus Errores Scholarum paſſim deteguntur, ac Veritas Philoſophiæ, quam CARTESIANAM vocant, confirmatur. Auth.* Johanne de Raei, *Phil. in Illuſtri Athenæo Amſtelod. Prof. prim.* Amſtelodami, *Anno* 1677. *in* 4°.

AS the *firſt* Edition of this Piece, printed many years ſince, contained chiefly *Six* Diſſertations, *viz.*, concerning 1. Vulgar and Philoſophical Knowledge: 2. Philoſophical Principles in general: 3. The Nature of Body: 4. The Origin of Motion, together with an *Appendix*, giving an account of *Ariſtotle*'s opinion of the *Firſt Mover*: 5. The Communication of Motion, and the Action of Bodies upon one another: 6. The Subtile *æthereal* Matter; So this *Second* Edition is enriched with *Seventeen* Diſcourſes, which ſeem to be very conſiderable. And they are, touching

1. The genuine Doctrine of *Ariſtotle*, and the great difference of the pretended *Ariſtotelian* Philoſophy of the Schools, from *Ariſtotle*.

2. The Knowledge of Man; what it is; wherein it conſiſts; how the *Mind* by conceiving and knowing is ſo far from being exhauſted and rendred *effete*, that thereby it is made much more *fecund* and vigorous; and eſpecially, that the Nature of the *Mind* doth totally exclude from it ſelf the *Corporeal* Nature.

3. The Faculties of the Mind, and the Errors about Truth and Falſhood: Theſe Faculties this Author placeth, with his Maſter, in *Cogitation*, which comprehends all what is within us after ſuch a manner, as that we are immediately conſcious

conſcious of it to our ſelves: Whether it be, that the Mind in *perceiving* and *thinking* doth only behold it ſelf and act upon it ſelf, which is *intelligere*; or converts it ſelf to a Body, and ſees therein ſomething conform to ſome *idea*, either underſtood by it ſelf, or perceived by ſenſe; which is *imaginari*, vel *ſentire*.

4. The Origin of Error in our Apprehenſion, Judgment, and Will.

5. The Principles of Human Knowledge, or True *Metaphyſicks*, teaching us to philoſophize aright and in good order, and furniſhing the other parts of Philoſophy with their due Objects, and giving them their certainty and evidence.

6. The Truth and Order of human Knowledge; oppoſed to the Sects of the *Academicks*, who profeſſing an *Acatalepſy*, affirmed this one thing only to be certain, *Nihil certi ſciri poſſe*.

7. The *Idea* of GOD, ſhewing a way, whereby every one may find that *Idea* in himſelf, not only he that believes the Exiſtence of God, but he alſo that diſ-believes it.

8. The Subſtantial Form, and the Soul of Man; out of *Ariſtotle*, againſt the *Ariſtotelians*; ſhewing, that that Form of Man, as he is a Compound of Soul and Body, is no other but that Union, by which the Soul is mancipated to the Body in moſt of her functions.

9. The Syſtem of the World, and the Elements thereof; which, with *Des-Cartes*, he makes to be three; the *firſt*, that which emits Light, and conſtitutes the lucid Stars; the *ſecond*, that which every way tranſmits Light as the Heavens do; the *third*, that which reflects Light, or is neither lucid, nor luminous, but opaque, as Comets, Planets and our Earth.

10. The Vital Spirit in Man and Brutes, which he makes to consist not only of an *Oleaginous*, but also a *sharp*, and *aqueous* substance, mov'd by the first and second Element, lately mention'd: the *Oleaginous* part being in its nature very movable and inflammable; the *sharp* particles acuating and strengthning the force of the fire; the *aqueous ones* contempering the rest, and keeping them from too vehement a motion and heat, such as it would be, if the spirit were converted into a burning fire.

11. Heat and Cold; their Nature, and Origin: The *nature* of the *former*, a vehement motion of the smallest particles in bodies; of the *latter*, the want of all motion. The *cause* of the one, the Sun and the Heavens; of the other, the want of being mov'd by them.

12, and 13. Hardness and Fluidity; Humidity and Siccity: To which are subjoyned four Discourses more, *viz.* of *Place*; of the Constitution of *Logick*, (which he comprehends in four very plain and important Rules;) of the Constitution of *Physiology*, whose office it is, to explain the *phenomena* of the Universe by intelligible causes; and of the *Wisdom of the Ancients*, deduced by him according to the series of times and periods; wherein it hath considerably changed either for the better or worse.

II. *Nou-*

II. *NOUVELLE SCIENCE DES TEMPS, ou Moyen general de concilier les Chronologues ; par le S.* Menard, *Seigneur d'Iſerné. A* Paris, *in* 12o.

THere being found ſo little certainty among Chronologers, this Author endeavours to reconcile them, by propoſing four principles, whereby he pretends to make it out, that they may be made to agree together.

The *firſt* is, that in every *Æra*, or way of computing the Times, otherwiſe called *Epocha's*, there are divers Hypotheſes, of which ſome are ſhorter, ſome longer.

The *ſecond*, that the new *Æra's* are eſtabliſhed upon the Ancient, according to their different hypotheſes.

The *third*, that the different marks of the Time of the Events, which depend upon different hypotheſes, do ſignifie one and the ſame time.

The *fourth*, that the Time or Year wherein the Event is come to paſs which gives the name to every *Epocha*, is certain, and agreed upon by all Authors.

For Example, *Pliny* ſaith, that *Theophraſtus* affirms, that *Callias* found *Vermillon* ninety years before *Praxibulus*, Pretor of *Athens*; which comes to the three hundred forty ninth year of *Rome*. *Praxibulus*, according to the Chronology of the *Greeks*, was Pretor of *Athens* the third year of the one hundred and ſixteenth Olympiad. The ninetieth year before him falls out in the firſt year of the ninetieth Olympiad, which, according to *Eratoſthenes*, is in effect the three hundred forty ninth year of *Rome*. But the ſame year of the ſame Olympiad, according to *Varro*, is the three hundred one and fiftieth of *Rome*: On the contrary, that year which is the three hundred forty ninth of *Rome*, according to *Varro*, is the third of the ninety third Olympiad, according to *Eratoſthenes*.

So that you may ſee by this Example, (wherein *Pliny* makes uſe of the firſt hypotheſis of *Eratoſthenes*, though elſe he often uſeth the firſt of thoſe that have reſpect to *Euſebius* and *Varro*)

the truth of all these principles: 1. That in the same *Æra* there are different hypotheses: 2. That the different marks of the Time of the invention of *Vermillon*, which depend from those different hypotheses, signifie one and the same Time: 3. That the difference, which is found between *Varro* and *Eratosthenes* as to the Olympick years, is the same with that, which would be there found, if both of them had continued to reckon by the Years of *Troy*, which is a certain *Epocha* until the Event proposed: 4. That *Varro* only adds two years to the Years of *Rome*, because he establishes the *Æra* of *Rome* upon that of *Troy*, according to the shortest hypothesis.

To learn easily the practice of these Principles; after the explication given of the Origin of the *Æra* of *Antioch* (of which no Author hath made any mention before *Eusebius*,) of the *Æra* of *Spain*, and of the *Vulgar Æra*, which are the *Christian Æra's*, to which the Incertainty of the Interval from *Exodus* unto the Building of the Temple hath given place; this Author subjoyns six Rules, in which he collects and explains, what concerns, in Chronology, the *Hebrews*, *Greeks*, *Romans*, *Babylonians* and *Persians*. He likewise examines, what concerns the *Ægyptians* upon the occasion of the Eclipse noted by *Josephus*, *lib.* 17. *c.* 8. of the *Jewish Antiquities*; where he very handsomly explains their Year, and what was their *Sothiaque* period. He also largely treats of the *Epocha* of the *Nativity of our Lord*, as well as of the Time of the Reign and Death of *Herod*, to whom he assigns forty years for his Reign, &c.

III. ENG-

III. ENGLANDS IMPROVEMENT *by Sea and Land: To out-do the* Dutch *without Fighting: To pay Debts without Mony: To set at work all the Poor in* England, *with the Growth of our own Lands: To prevent unnecessary Suits in Law, with the benefit of a Voluntary Register: Directions, where vast quantities of Timber may be had for the building of Ships: With the advantages of making the Great Rivers of* England *Navigable: Rules to prevent Fires in* London, *and other Great Cities: With Directions, How the several Companies of Handicrafts men in* London *may alwaies have cheap Bread, and cheap Drink. By* Andrew Yarranton *Gent. in* 4°.

MAny Worthy Authors, (mentioned and recommended in our Former Volumes) have written excellently well, to excite and instruct the Planting of Forrests, Woods, Coppices, Nurseries, Orchards, Walled Gardens, for Delicacies; Houshold-Gardens, for Necessaries; Vineyards, Mulberries: To adorn fair Mansions with the fairest Vegetables: To plant Saffron, Licorice, Potado's, Hops, Hemp, Flax, Diarsweed, Weld or Would, Oad, Madder, Saffe-flowers: Of manifold Improvements of Pasture and Arable, and all kinds of Agriculture: Of Vinous Shrubs to make Sugar-Wines from the shalloweſt heaths: Of Commerce and Navigation: The Fishery; Hunting, Hawking, Fowling, Fishing: Of many Inventions,

tions, and New Artifices: *Englands* Intereſts and Improvements: The Prevention of Poverty.

And we have publiſhed (*Numb.* 25. *p.* 464.) ſome Adviſes, How Granaries are built and ordered in and about *London*, at *Dantzic*, and in *Muſcovia*: How Corn is to be fitted and prepared for Granaries. And (*Numb.* 96. *p.* 6092.) we gave notice, How the Corn of the laſt years growth was damnified in the Granaries at *Dantzick*, by much Thunder and Lightning the Spring following; and what the Remedy. And 'tis averred (*Numb.* 25.) that Corn in the Granaries of *Zurich* in *Switzerland* was preſerved eighty years, and in *London*, thirty two years. Some of theſe our Solicitations (eſpecially for Cider-Orchards) took ſo good effect in the Southern parts of *England*, that they are much enriched thereby; but in the heart of *England*, and the Northern parts, where they have moſt need of them, they are yet much wanting. *Agriculture* is the fund and foundation; and *Trade* and *Commerce*, the ſuperſtructure; and *Common Honeſty*, the ſtrongeſt Joynt to unite both together, To make *England* truly happy.

And the next beſt juncture to Granaries, is good Store of Eſculent Gardens and Orchards, to make all neceſſary Diet cheap and at hand. In the pariſh of *Netherburgh* in *Dorſetſhire*, near *Bimeſter*, they do already in good years make three thouſand hogſheads of good Cider; This preſent year they made ſome hundreds above two thouſand hogſheads: And for ſome private Manſions in *Devonſhire*, they make four hundred, five hundred, ſix hundred, and, in plentiful years, ſeven hundred hogſheads of ſtrong and excellent Cider. This we have from good hands; and this is a good Example from the Weſt.

But here our Author hath diſcovered the Myſteries of Trade univerſally for all parts of *England*: (Which I have publickly acknowledged to be above my skill in the great

great Concernments of *Lucre.*) And he hath detected the Mysteries of Iniquity, How some wealthy Merchants, and over-busy Factors, do hinder Trade and our Staple-Manufactures for private lucre, to the great damage of their own Native Country. He adviseth good Remedies. He proposeth, what Trades are proper to be advanced in the several parts of *England*: How to be there Advanced: What the peculiar Conveniences: All Requisites directed: Where the Trade of Fine Linnen is first to be set up; namely, in *Warwick*, *Leicester*, *Northampton* and *Oxfordshire*. Why, and How to be set up first there. In the West of *England*, in *Glocester*, *Worcester*, *Wiltshire*, *Shropshire*, *Staffordshire*, and in some parts of *Warwickshire*, Cloathing of all sorts: And in *Kent*, *Essex*, *Surrey*, *Sussex*, *Suffolk*, *Norfolk*; in *Derby*, *Nottingham* and *Yorkshire*, Woollen Manufactures to be encouraged: How, and with what great advantages the Trade of Spinning fine Thred and Tape may be set up in *Herefordshire*? Whence Provisions may be raised best for the City of *London*; and how their Handicrafts may be improved? Where Iron-Mills, and Iron-Works, may for General profit be promoted; himself having been long practiced in that Imployment? What Rivers, in *England* and *Ireland*, may be made Navigable; himself having surveyed them, and made some considerable Rivers Navigable?

And himself acted diligently, with Instructions and furnishing Seed, or other Materials, for the effectual Improvement of the greatest part of *Worcester*, *Glocester*, *Hereford*, *Stafford* and *Shropshire*, in all their Ryelands. And, like a *Joseph* in *Egypt*, he here adviseth Granaries, Work-houses, and other publick helps for *Trade* in the fittest places, all over *England*; and a *Register*, which is practiced with good success, and is the life of Trade at *Taunton* in *Somersetshire*, and in some Forraign parts, where Trade prospers most; and 'tis one of the best supports of *Scotland*.

Thus he runs through all the Intrigues of Trade, noting the secret abuses, and obstacles; and offering genuine Remedies,

medies, confirmed by the Experience of Forraign Nations, large Territories and Principalities. And if the beſt of this Authors ingenuous Propoſals may be fortified by good Laws, and thoſe Laws duly executed, we may hope, that the Trade of *England* may, in a ſhort time, recover, and proſper, as it doth among the Wealthieſt of Forraigners; for the great relief of our vaſt numbers of Indigents, and to free this Kingdom from the ſhame and burthen of idle Beggars, and of ſturdy Vagrants.

At the end of this Treatiſe he promiſeth a *Second* part, conſiſting of *ſeven* Heads; which are ſo promiſing, that we heartily wiſh to ſee them abroad with good ſpeed, to prevent all unhappy Caſualties.

Imprimatur,

January. 25.
167$\frac{6}{7}$. *BROUNCKER*, P.R.S.

LONDON,

Printed for John Martyn, *Printer to the* R. Society, 1676.

PHILOSOPHICAL TRANSACTIONS.

Februar. 26. 1676.

77

The CONTENTS.

A Continuation of Mr. Boyle's *Experiments, publiſhed in the next foregoing Tract, about Fluids contiguous to other Fluids. An Account of two Books:* I. *PALÆOLOGIA CHRONICA, &c. by* Robert Cary, *D.LL.* II. *A TOUCH-STONE for Gold and Silver-Wares, &c. by* W. B. *of* London *Goldſmith.*

A Continuation of Mr. Boyle's *Experiments publiſhed in the laſt Tranſactions; for which there was no room there.*

IN the Winter time, and at other times alſo when the Air is cold enough, the figure, acquir'd by the ſurface of an Oil contiguous to the Water on one ſide, and the Air on the other, may be preſerved from varying, and ſo may be at leiſure obſerved by the Direction afforded by the following Experiment, which I deviſed for this purpoſe.

In Cold weather we took Eſſential Oil of *Anniſeeds*, whoſe property it is to coagulate in ſuch weather, and having in a gentle warmth brought it to be fluid, we poured Exp. XIV it into a ſlender Viol more than half filled with Common water, that had been alſo a little warmed, that the Oil might not be too haſtily reduced to its former ſtate. This Oil being lighter than ſo much Water, and being poured on in a convenient quantity, had its upper ſurface ſomewhat concave, as that of the Water was; but the lower ſurface, ſurrounded by the Water, was very convex, appearing almoſt (for it was not perfectly) of the figure of a great Portion of a Sphere. This being done, the Viol was ſtopt, and ſuffered to reſt for ſome time in a cold place, by which means the Water continuing fluid as before, the *Oil of Anniſeeds* was, as I expected, found coagulated in a form approaching to that it had whilſt in a fluid ſtate; I ſay, approaching, becauſe it was not eaſie to diſcern the exact

Figure in the Viol I was fain to make use of: and I suspected, that the Oil grown consistent was become less convex than before; but the two *surfaces* of it gave it some resemblance in point of shape, but not of transparency, to a *Concavo-Convex Glass*; but yet much thicker in the middle than is usual in Glasses of the like breadth, employed for *Dioptrical Purposes*. And indeed (to give here this Advertisement once for all) I would not have you understand in too strict a sense, what my intended brevity, and some other Motives, make me deliver in naming the Figures of *Fluids*. For I confess, that if I were to write for a rigid *Geometrician*, especially if he were nice and critical in the Doctrine of *Conic Sections*, I should think my self obliged on some occasions to a greater Curiosity in naming the Figures of *Fluids*, than you will meet with in this Paper: But since I write but Notes, and design to give you rather Experimental hints, than *Geometrical* Determinations, I presume, that when you are once cautioned by a plain Advertisement, it may suffice for me to refer the *Fluids*, I describe, to such of the more known *Figures* as they seemed to be the least remote from, without troubling you or my self with maim'd Figures, or with *Spheroids*, *Conoids*, *Paraboloids*, and other hard words; which I the rather abstain from, not only because the Particulars, wherein my *Fluids* resembled them and differ'd from them, could not be intelligibly declared without many words; but because I observed the *Figures* themselves of the *Fluids* to vary, and sometimes considerably too, according to Contingent circumstances. And for this Reason also I will not perswade you to expect, that the event of every Trial, you shall make of these Experiments, will be precisely the same with the event of mine. For by reason of those contingent Circumstances, I dare only speak Historically of these Experiments, and, without pretending that they shall always uniformly succeed, content my self to relate *bonâ fide*, what Trials have been made, and what happen'd to me thereupon, not despairing, that this variation it self of Events according to Circumstances may be Instructive.

But to return to our lately mentioned *Oil of Annisseeds*, 'twas worth observing, how great a difference there was between the dull reflection it made when 'twas coagulated, and the fine reflection it had made whilst 'twas a Liquor. The later of which

Reflections

Reflections brought into my mind, how vivid the reflective power of some *Fluids* is in comparison of that of the generality of Solid bodies, of which there is scarce any, if there be any at all, that is observed to have a stronger Reflection than clean *Quicksilver*; and yet (to add that upon the by) I have sometimes found, that this it self may be increased by the addition of a Liquor. For having observ'd, as I elsewhere note, that *Quicksilver*, and Rectified *Oleum Petræ* are, the former of them the heaviest, and the later the lightest of all the visible *Fluids* that are yet known to us, or at least to me; and having also observed the later of them to be considerably reflective, I had the Curiosity to try among other things, that related to them, the following Experiment. Some (Distill'd) *Quicksilver* being put into a small Viol, and held in such a posture, that the incident Light was strongly remitted to my Eye, I slowly put to it some *Petroleum*, that being well rectified was very clear, and observed, that, as this Liquor cover'd the *Quicksilver*, there was at the Imaginary Plain, where they both confined, a brisker Reflection than the *Quicksilver* alone had given before; whether this increase of Reflective power proceeded from any thing produced upon the confines of the two Bodies, or from some *Ethereal fluid* that slip'd in there, I have above declined, and shall now forbear, to examine: But on this occasion it will not be amiss to take notice, that either the surface of the Air it self, as thin and yielding a *Fluid* as it is, or the surface of a Solid, contiguous to included Air, or some interposed subtile matter, may reflect the Incident beams of Light more strongly than most men would expect. To this purpose I remember, that a Curious Person having one day brought me a couple of Rarities, which he told me were two pieces of a solid, but transparent, body, that he had casually found; in one of which there was a *Pearl*, large, round, and orient, and in the other a less perfect one; and having desired my Opinion, whether they were considerable enough to be presented to the King: I, after I had sufficiently view'd them in differing Positions, and especially against the Light, asked him, whether he were sure the included bodies were *Pearls*. To which when he answer'd, that his Eyes permitted him not to doubt of it, especially because he knew of no other Gems nor Stones, that had so strong and fine a Reflection; I replied, that I thought they might be only bubbles

Exp. XV.

of Air, casually intercepted in the viscous matter of the containing Bodies, (which I supposed, upon good grounds, to have been once somewhat *fluid*,) before it came to be hard; adding, that His *Majesty*, who was Critical in these matters, might probably have the Curiosity, I had, to have the worst of them broken, to be satisfied what kind of bodies the included were. Hereupon, to content me, one of them was open'd, and that which had appear'd a *Pearl* was found to be but a Cavity, that contain'd no grosser substance than Air. And I have by me a well shap'd piece of *Glass* of a good thickness, with an *Aereal bubble* in the middle, which by some qualities, particularly its *Pear*-like shape and vivid reflection, does not ill resemble a fair, though not *Orient*, *Pearl*. But in such like Observations, the Position of the Eye, and that wherein the Body receives the beams of Light, may be very considerable. For I have by me a small Stone (with which I have puzled the Skilful *Jeweller* of a great Prince to determine what kind of *Gem* it is) that being laid flat upon ones hand, or a piece of Paper, and lookt on directly downwards, looks almost like a piece of common *Glass*, and is transparent: But if the Eye be so placed, that the Incident beams of Light, by whose Reflection 'tis seen, fall with a convenient degree of obliquity upon the Stone, it makes an exceeding pretty shew, sometimes appearing like a fine *Opal*, and sometimes not very unlike an *Orient Pearl*.

Exp. XVI. It may not be altogether impertinent, and at least, for the Novelty of the way of Trial, it will not probably be unpleasing, if I here mention an Attempt to try, whether, when the Rays of light rebound from bubbles inviron'd with an uniform Solid body (which case is somewhat differing from that of Bubbles look'd upon in an exhausted *Receiver*,) the Reflection be only, or almost only, from the grosser Particles of the Air, and not also from some Subtile matter harbour'd, as well as they, in the same Cavities? But to bring this question to Trial, seemed difficult enough, because it is so, to include very rarified Air in a consistent body, *diaphanous* enough to let its reflection be easily observed. To compass this, I thought upon the following Expedient. We made, according to the easie direction * elsewhere given, (for other purposes,) a competent quantity of a *Resinous* or *Gummous* substance, that looked like high colour'd *Amber*,

* *In the usef. of Experiment. Philosophy.*

Amber, but was eaſie to melt. This we put into a deep round Glaſs with a wide mouth, and held it by the fire-ſide in a moderate warmth, till it was brought into a *fluid* ſtate; then we tranſfer'd it into one of our *Pneumatical Receivers*, where we preſum'd, that this Temporary Liquor would, as well as Liquors that are conſtantly ſuch, diſcloſe *Aereal bubbles*, when the preſſure of the Air was withdrawn from it; and accordingly having cauſed the *Air* to be pumpt out by degrees, we found, that ſtore of Bubbles appear'd at the top of the Liquor, and made there a copious Froth, many of them being, by reaſon of the *viſcoſity* of the Fluid, very large, and divers of them, becauſe of the Nature and Texture of it and the Thinneſs of the films, being adorn'd with the colours of the *Rainbow*, whoſe vividneſs made them pleaſant to behold, and ſuggeſted to Us ſome *Optical* Conſiderations. But notwithſtanding this Froth, I cauſed the pumping to be continued, that thoſe Bubbles that had moſt of common Air in them, and which therefore are wont to riſe firſt, might get to the top, and the ſubſequent Bubbles might meet with more reſiſtance from the Liquor ſtill tending to grow cold, and ſo might be the more expanded, and yet kept from emerging by the concretion of the *Reſinous* ſubſtance; and anſwerably to this we found, that, when this Subſtance had reſumed its conſiſtent form, there were intercepted, between the upper and the lower *ſurfaces* of it, ſome Bubbles that were not ſmall, which yet had a conſiderable Reflection, notwithſtanding the ſmall quantity of the groſſer Particles of the Air, that may be ſuppoſed to be contained in Bubbles ſo very much expanded, (perhaps ſo, as to exceed ſome hundreds of times their former Dimenſions.) I might add, that by letting the outward Air into the *Receiver*, the Air in divers of the formerly mention'd large Bubbles, at the top of the Glaſs, was too much rarified to keep them from being broken by the preſſure of the returning Air. But I am ſenſible, that, in what I have ſaid of the Reflective power of the Air, I have already too far digreſſed, and therefore I ſhall ſtep into the way again, and proceed to other Obſervations.

Water being ſo conſiderable a Body here below, I thought, it would be worth while, to endeavour to obſerve its *Surface* when contiguous to other Fluids than *Air*; and, if it were poſſible, when ſurrounded by them. For though Exp. XVII.

'tis

'tis taken for granted, that the falling drops of *Rain* are ſpherical, yet their deſcent is ſo ſwift, both by reaſon of their Gravity in reſpect of the Air, and the height from whence they fall, that I fear men have rather ſuppoſed than obſerved that their figure is Spherical; which will be the more queſtionable, if it be true, which is vulgarly thought, that *Hail* is but *Rain* frozen in its paſſage through the Air. For 'tis evident, that the grains of *Hail* are frequently of other figures than truly orbicular. But becauſe there may another poſſible Account be given of this Irregular Figuration of *Hail*, I ſhall not inſiſt on this *Phænomenon*, but proceed to what I tried about the *Surface of Water*; of which I found it the more difficult to make Obſervations, becauſe that Liquor will readily mingle both with *Spirit of Wine* and with *Oil of Tartar*, and with other Liquors that are analogous to either of theſe.

The *Surface of Water* may have differing Figures, according as 'tis totally incompaſſed with *heterogeneous fluids*, or, as 'tis only in ſome places contiguous to one or more of
Exp. XVIII. them. In the former caſe we found it not ſo eaſie to make an Obſervation, both becauſe, that, as I lately noted, we know not of any two Liquors (ſetting *Mercury* aſide) that will not mingle either with one another, or with *water*. And becauſe alſo our *Oil of Guajacum* it ſelf, though heavier than *Water*, would not be ſerviceable on this occaſion, in regard of its being of ſo deep a Red, that the figure of the Water incloſed in it could not be diſcerned through it; wherefore I made uſe of Chymical *Oil of Cloves*, as being ſomewhat, and but a little, heavier in *Specie* than Water, ſo that ſome drops or ſmaller portions of this laſt nam'd Liquor would be almoſt quite inviron'd with the other: We cautiouſly therefore conveyed into ſome *Oil of Cloves*, whoſe *ſurface* the Veſſel permitted to be large enough, ſome portions of *common Water* of differing bigneſſes, taking care, as far as we could, that they might not touch one another; by which means the Oil being tranſparent, and yet ſomewhat colour'd, 'twas eaſie to obſerve, that the ſmaller portions of Water were ſo near totally inviron'd with the Oil, that they were reduc'd into almoſt perfect globes; thoſe portions, that were ſomewhat bigger, (as about twice the bigneſs of a *Pea*,) would be of a figure ſomewhat approaching to that of an *Ellipſis* (for 'twas not the ſame)

ſame,) and thoſe portions that were yet ſomewhat larger, though they ſeem'd to be ſunk almoſt totally beneath the Oil, yet they held to it by a ſmall portion of themſelves, whoſe *ſurface* was eaſily enough diſtinguiſhable from that of the Oil. Theſe larger portions of immers'd Water, being almoſt wholly inviron'd with the other Liquor, were by it reduc'd into a round figure, which was ordinarily ſomewhat *Elliptical*, but more depreſs'd in the middle than that figure requires. But all this is to be underſtood of thoſe portions of Water, that touched only the Oil and the Air: for thoſe that touched one another without mingling, and much more thoſe that adher'd more or leſs to the ſides of the Glaſs, had their *ſurfaces* too differingly and irregularly figur'd to be here attempted to be deſcribed.

As for the *Superficial figure of Water*, contiguous, both above and beneath, to other *Fluids*, and laterally to ſome Solid body, 'tis not ſo eaſie to be ſure, which of the contiguous Liquors is of moſt force to determine the figuration of their common *ſuperficies* or *Commiſſure*. But however I ſhall relate, that, having into a ſlender Pipe of that ſort that has been deſcrib'd before, put a little *Oil of Cloves*, and upon this ſome *Oil of Turpentine*, that ſo the Water might both above and beneath be touched by *heterogeneous Liquors*, I obſerv'd not the *Oil of Cloves* to be very manifeſtly tumid at the top, nor the lower ſurface of the *Oil of Turpentine* (for the upper was Concave) to be very Convex; for ſomewhat *convex* it was, downwards. And from this 'twill be eaſie to conclude, the *figure* of the Cylindrical portion of Water intercepted between theſe two Oils. Exp. XIX.

That Agent or force, whatever it be, that keeps Liquors *fluid*, does likewiſe, whilſt they are ſo, keep their *ſurfaces* exceeding ſmooth, when they are contiguous to the Air and other Fluids. But becauſe I thought it doubtful, whether even thoſe Liquors that are (as Men uſually ſpeak) *naturally* fluid, I mean, ſuch as are not made ſo by fuſion, produced in them by the action of the Fire, would retain ſmooth ſurfaces when they have loſt their *fluidity*, and have their parts no longer inflected and agitated, ſo as to enable them, by the help of *Gravity*, *Viſcoſity*, or both, to *levigate* (if I may ſo ſpeak,) or poliſh each others ſurfaces, as it may be ghes'd in their fluid ſtate they did;

I thought it not amiss, in order to the clearing of the doubt, to make some Trials with *contiguous Liquors*, whereof one would continue fluid when the other had lost its fluidity.

I took then *Oil of Annifeeds*, thaw'd by a gentle warmth, and *common Water*, and having put them together in a conveniently shaped Glass, they were suffer'd to stand in a cold place till the Oil was coagulated; which done, it was parted from the Water, and by the roughness of its *superficies* manifested, as I expected, that, when its parts were no longer agitated and kept easily displaceable by the subtile *permeating* matter, or whatever other Agent or Cause it were, to which it ow'd its Fluidity, then the contiguous Water grew unable to inflect, or otherwise p'ace them after the manner requisite to constitute a *smooth surface*. And what happen'd to that part of the Oils surface that was touch'd by the Water, happen'd also to that which was contiguous to the Air; save that the *asperity* of the last nam'd surface was differing from the other, which, whether 'twere an accidental or constant *Phœnomenon*, further Trial must determine. But I have often observed, that the upper surface of *Oil of Annifeeds*, when this Liquor comes to be coagulated by the cold Air, was far enough from being smooth, being variously asperated by many flaky particles, some of which lay with their broad, and others with their edg'd, parts upwards.

Exp. XX.

An *inequality* and *ruggedness* of *superficies* I have also observ'd in Water, when, having cover'd it with Chymical *Oil of Juniper*, and expos'd it in very Cold weather, though the Oil continued fluid, yet the Water, being frozen, had no longer a smooth *superficies*, as whilst in its liquid state 'twas contiguous to the Oil. And the like Inequality, or rather a greater, we observed in the surface of Water frozen, which had Chymical *Oil of Turpentine* swimming over it; yet a no less, if not a much greater, roughness may be oftentimes observed in the surfaces of divers Liquors that abound with Water, when those Liquors being frozen, their *surfaces* have an immediate contact with the Air. This I, among others, (elsewhere) observed; And I shall here add, that having purposely caused a strong and blood-red decoction of the *Soot of Wood* to be exposed in a large Glass in a very Cold night, I was more pleased than surpriz'd, to find in the morning a Cake of

Exp. XXI.

Ice,

Ice, that was curiously figur'd, being full of large flakes shap'd almost like the broad blades of Daggers, but neatly fringed at the edges. But that which I chiefly mention these Figures for, is, that they seem to be as it were imbost, being both to the Eye and the Touch rais'd above the Horizontal plain or level of the other *Ice*.

And here I must not omit to take notice, that whereas in the recited Experiments the rugged surface was produced at the Confines of two *heterogeneous* and unsociable Liquors, I have sometimes observed the like *Phænomenon* in one and the same Liquor, and particularly, not long since looking in Frosty weather on a Viol where I had long kept *Oil of Vitriol*, I perceived, that the Cold had reduced far the greatest part of the *Menstruum* into a consistent Mass, whose upper surface was very rugged and odly figured, though it lay cover'd all over with a pretty deal of high colour'd Liquor, that was not frozen or coagulated, nor seem'd disposed to be so, at least in that degree of Cold. Exp. XXII.

This brings into my mind, that not only Bodies, which in their Natural state (as 'tis wont to be call'd) are *fluid*; but also such, as, by the violence of the fire, are made to flow, may be conformable to some naturally Fluid bodies in their superficial Figures. This may be observ'd in the best sort of what the Chymists call *Regulus Martis stellatus*, where the figure of a Star, or a figure somewhat like that of the *Decoction of Soot* lately mention'd, will frequently appear imbost upon the upper *superficies* of the *Regulus*; and such a rais'd Figure I think I can yet shew you, on a Mass of *Regulus* made of *Antimony* without *Mars*. But if, to those two bodies, *Copper* be also skilfully added, the *Superficies* will be oftentimes adorned with new Figures according to Circumstances; though the most usual I took notice of was that of a Net, that seem'd to cover the surface of the compounded *Regulus*. But this is not so constant, but that I have by me a Mass of a *Conical figure*, consisting of two very contiguous, but easily separable, parts, whereof the lowermost, which abounds more in Metal, hath its upper surface cover'd with round *protuberances*, in shape and bigness not unlike to small *Pease* cut in two; and these are so really imbost and elevated above the rest of the *superficies*, that the other part of the Cone, which is of a more Exp. XXIII.

ſcorious Nature, has, in its lower ſurface, which exactly fits the upper of the *Regulus*, Cavities, for number, ſhape and bigneſs, anſwering to the *protuberances* lately mention'd; which argues, that the *Regulus* cooled firſt with that Inequality of ſurface we have deſcrib'd, and that the lighter and more Recrementitious ſubſtance, continuing longer fluid, had thereby opportunity to accommodate it ſelf to the ſuperficial Figure of the *Regulus*, on which it firſt lean'd, and was afterwards coagulated.

So far of this Sequel at the preſent; what remains may be expected at the firſt conveniency.

An Account of two Books:

I. *PALÆOLOGIA CHRONICA: A Chronological Account of Ancient time: In Three parts; Didactical, Apodeictical, Chronical. By* Robert Cary, *D.LL. Devon.* London, 1677. *in fol.*

THe Deſign of this elaborate Work ſeems to be, to determine the juſt interval of Time between the great *Epocha* of the *Creation of the World*, and that other of the *Deſtruction of Jeruſalem* by *Titus Veſpaſian*, in order to the aſſignment of ſuch particular *Time*, wherein Perſons and Actions of old had their Exiſtence. For the performance of which, the Learned Author divides this his Book into *three* main parts.

In the *firſt* he treats not only of his Meaſure in general, which is the *Year*, and its parts; but alſo of the *Julian Year* in particular, by him eſteem'd the fitteſt for his Uſe: conſidering it both in it ſelf, and in relation to other the moſt received kinds, for the reducing of them to this. Where comes-in the *Julian Period*, of which he diſcourſes very fully; ſhewing *firſt*, How it is made up, *viz.* by the Multiplication of the Cycles of the *Sun*, *Moon*, and Indiction into one another, as 28 into 19, and the product thereof into 15, which produces 7980, the *Julian Period*, ſo called, becauſe accommodated to the *Julian Year*; the ground whereof was taken from the Ancient *Greek* Church, perfected and promoted in this later Age by *Joſ. Scaliger*'s dexterity. *Secondly*, What the contrivance is of this

Julian

Julian Period, vid. That every single Year in the whole *series* of 7980 hath its proper Characterism, which no other Year, besides that, hath. So the first year of this Period hath for the Cycle of the *Moon*, 1; of the *Sun*, 1; of Indiction, 1; which three Cycles together will not be found in the whole Order, other than the first. So it may easily appear, how the first year after the *Christian Epocha* was affected, the Cycle of the *Moon*, 2; of the *Sun*, 10; of *Indict.* 4: which three Characters belong to the 4714 year of the *Julian Period*; by the concurrence of which three, this Year is discriminated from all others. Whence it will be easie to accord the Year of the *Julian Period* with any one of the *Christian Epocha*, by Addition or Subtraction: As (*e.g.*) the 603 Year *preceding* the *Christian Epocha*, if you *subtract* this number from 4714, the remainder, 4111, is the Year of the *Julian Period*: And if the Year be *after* Christ, if then you *add* to the number of the Year so given 4713, as this year from Christ's Nativity 1676, you'l have it to be the 6389 of the *Julian Period*, having for its characters that of the *Moon*, 5; of the *Sun*, 5; of *Indict.* 14: And so you have a ready way, by the help of this Period to determine the Characters belonging to any Year.

Having shew'd the Use of this Period, he adds the Method of reducing the Years of other Reckonings to the *Julian Year*, and to that of the *Julian Period*; as that of the *Ægyptian* or *Nabonassaræan*; that of the City of *Rome*; the *Græcian* and *Jewish* Year, &c.

In the *second* Part, are laid down the two *Bases* of Chronography, *viz.* Astronomical Observations, and Historical Tradition: Of which the *former* may be looked upon as certain and demonstrative; the *later* must be distinguished according to the Historians, as they are with us more or less creditable, or more or less consonant with others of good credit. Here occurs *first*, a *Thesaurus* of Astronomical *Phænomena*, or a Table of *Eclipses* and other *Cœlestial Appearances*, together with the Time in which they were observ'd, according to the Writings of Historians and Mathematicians, by our Author specified. *Next*, Creditable Memorials of the Succession of *Princes* and *Rulers*, serving to direct these Inquiries, as is that considerable *Astronomical Canon* deduced from *Nabonassar* to *Antoninus Pius*, under whom *Claud. Ptolomæus*, the famous *Ægyptian*

Mathematician, flouriſhed. And foraſmuch as among the manifold great Events, which have happen'd in the Courſe of Affairs, thoſe that have been the Original or Eſtabliſhment of great Families, and Empires, and Cities, or the Extinction and Subduing of others; the Inſtitution and Conſtitution of Publick Conventions of People; great Inundations and Conflagrations, and other the like Deſtructions; foraſmuch, I ſay, as ſome of theſe have been the occaſion and ground of the received *Epocha*'s of Time; our Author makes it part of his buſineſs here truly to ſtate them: As that of *Nabonaſſar*, of the *Olympiad* Computation, of the Foundation of the City of *Rome*, of the *Calippic* Period, of the Years of the *Seleucidæ*, the *Dionyſian*, *Tyrian*, and many more; among which are ſeveral *Epochæ* of Time, antecedent to thoſe juſt now mention'd; as that of the Deſtruction of *Troy*; the Floods of *Ogyges* and *Deucalion*; and beyond theſe, the Original of thoſe Ancient Principalities of *Sicyone*, *Argos* and *Athens*.

And theſe being determined by our Author, he deſcends to ſome of thoſe that are nearer hand; and in the firſt place, to that Memorable *Epocha*, wherein all Chronologers, old and new, do agree, which is the Beginning of the Principality of *Cyrus*, which was *Ann.* 1. *Olympiad.* 55. Whence appears the true State of the *Perſian* Succeſſion, from *Cyrus* to *Alexander*, or from the taking of *Babylon* by the former, unto the taking of the ſame by the later. *Next*, he paſſes to the points of Time belonging to *Alex. Magnus*; then, to the Succeſſion of the *Ptolomæi*, to the Death of *Cleopatra*; then, to the *Syro-Macedonian* Succeſſion, from *Seleucus Nicanor* to *Antiochus Aſiaticus*. From this *Epocha*, he tacks about, returning to the head of the *Perſian* Dignity under *Cyrus*, which head was *Arbaces*'s Revolt from the *Aſſyrian* Monarchy, here manifeſted to be a compleat Century of Years before the common received Reckoning by *Olympiads*. And as a concurrent in time with the *Medes*, he doth in this place explicate the *Lydian* Succeſſion. After which he exhibits the *Babylonian* Succeſſion, beginning at *Nabonaſſar*, unto the expugnation of *Babylon* by *Cyrus*, and the extermination of *Nabonidas*: And then, the *Aſſyrian* Succeſſion from *Belus* to *Sardanapalus*; which he clears from Objections, and eſpecially a main one of Biſhop *Uſher*. To which he ſubjoyns two other Lines of Succeſſion precedent to the

Aſſyrian,

Assyrian, but subsequent one of them to the other, *scil.* of the *Chaldæan* and the *Arabian* : Where he notes the Extravagance of the *Chaldæan* Reckoning. And so our Author is at length got up to the Head of the *Asian* Government, as far as Human Writers could guide him.

After this, he proceeds to the *Ægyptian* Succession, and having taxed the Vaunt of this Nation concerning their Antiquity, and consider'd, what other Chronologers do deliver of their Succession, he gives us a perfect Scheme of their Chronology, from *Menes*, to the Conquest of *Ægypt* by *Alexander Magnus*.

This done, he examines the *Chinensian* Succession in their several Families, as it is shew'd by D. *Isaac Vossius* out of *Martinius*; as also by *Joh. Nieuhoft*; arguing withal the credibility thereof.

Having thus in many places of the World searched out the Originals of Government, by following the Line of their Successions *ordine retrogrado*; he passes in the last place to survey the Reckonings of the Holy Land, the *Jews* and *Hebrews* of old Time, according to those Ancient Records, the H. *Scriptures*; that so if he can obtain this end of his labours, which is, to see a good agreement between these several Lines, *viz.* of the *Gentile* Draught, and of the *Jewish* protraction, men may sit down well content therewith, as having master'd a matter of no small importance.

Here then, he shews a sure (as he esteems it) connexion of Sacred and Profane Story in the first year of *Evilmerodac*; represents a Scheme of Concurrent Successions from *Nabopolassar* to the death of *Alexander M*; gives a true state of the *Babylonian* Succession from *Evilmerodac* to *Darius* the *Mede*; expounds *Daniel*'s LXX Weeks in the next Literal sense, giving withal, in due place, an Interpretation of the same Week, in the Mystical sense; makes the first of *Cyrus* or the *Persian Monarchy*, the same with that of the *Jewish* Reduction out of *Babylon*, esteeming that as a second Point of connexion of Sacred and Secular History. This done, he makes a digression to a sober inquiry touching the Business of the Great *Synagogue* in digesting and compiling the Body of H. *Scriptures* of the Old Testament, as by us received. To which he subjoyns a Scheme of *High Priests*, from the Return of the *Babylonian* Captivity to

the

the Death of *Alexander M.* out of *Syncellus*; adding his own amendments thereunto.

These matters being dispatched by him, and thereby the passage smoothed for our Author's further progress, he gives us the course of Succession in the Line of the *Jewish* High Priests from *Jaddua*, to the extinction of the High Priesthood it self: In the doing of which, he settles the Scheme of *Herod*'s Line, as a thing very useful for the understanding of the Books of the New Testament, and for the fixing of his Intended Scheme.

After that our Author hath follow'd his design down along the course of Succession amongst the People of the *Jews*, as far as was needful, and even possible for him, unto the Destruction of *Jerusalem* under *Titus*, which he places in the Year of the *Julian* Per. 4783, *Ær. Chr. vulg.* 70; He returns to the Point of Time whence this Line began to be drawn, which was a former destruction of City and Temple under *Nebuchadnezar*, *An.* Jul. *Per.* 4125. From whence he continues his Line upwards, as high as the Creation, by the direction of the *H. Scripture*, in agreement with other approved Reckonings, to be met with in *Forrain* Writers. And this Line he divides into these four Spaces: 1. From the conflagration of the Temple last mentioned, unto the first Erection of the same by *Solomon*. 2. From the Building of the same, unto the Deliverance of the *Israelites* out of *Ægypt*. 3. From thence to the Birth of *Abraham*. 4. From this to *Noahs Flood*, and so to the *Creation*: Noting, upon occasion, the seeming Difference between the *Scriptures*, *Josephus*, and *Julius Africanus*, and masterly reconciling them; though the Difference between the *Masora* and the *Septuagint*, in the Years of the Geniture of the Patriarchs, be, in his Judgment as well as in that of others, irreconcileable. And here, he takes occasion to intimate the design of the Offending Party; examining and refelling the Charge against the LXXII; and asserting, that the Numbers which we have in our Books of the LXXII (generally speaking) are the very same with those which were of the *Septuagint*'s description; and proving it by *Jul. Africanus*, *Eusebius*, *Demetrius*, and others; and acknowledging *Josephus* to be an unreprovable Witness of the truth of these Numbers, and alledging Dr. *Is. Vossius*, as a Learned *vindex* of him. To which he adds, that the reckoning by these Numbers hath been the constant Reckoning of all Christian Churches for the

the first 900 years, and more; as also, that the Reckoning of the Eastern Churches is the very same to this day. He takes also notice, that the Credit of the *Septuagint* was at first questioned by Miscreant *Jews*, afterwards confronted by cross Translations of *Aquila*, *Symmachus*, and *Theodotion*, all of them averse to the Christian Doctrine. Further, he lays open the opportunity, which the *Rabbies*, that lived in *Adrians* time, had of making an alteration in the *Hebrew* Copies, that were then in being; and shews the unconcernedness of Christians in that matter. Where he also declares his account of the present *Hebrew* Copy; which though it be to him considerable, yet is it not (with him) of force sufficient to make him suspect the truth of the LXX in the Premises.

And if it be demanded, why the said *Rabbies* should be more solicitous about this matter of Curtailing these Numbers of the Age of the World, than about altering any thing besides, which perhaps would have been more to their purpose, as, for Example, in the Texts which concern the Person and Office of the *Messias*; if they had a mind, or dared, to have made an alteration at all? He answers, That they must needs see, that the *Allowance* of these Numbers of the LXXII, would have prov'd the absolute ruine of their Cause more effectually, than any thing that could be alledged against them. For, it would have demonstrated the Time of the *Messiah* to have been fully come and past, according to the general Tenet of their Schools, following herein the appointments of the Prophets, and of those others that were the later Commentators: Now more especially at such time, when after the Destruction of City, Temple, Government, 5500 years of the Worlds continuance being over, what more could they expect of a *Messiah* yet to come within his appointed time? For, it is but of late days, that they use this desperate Plea, that it is for their Sins the *Messiah* still delays his coming. Whereas for other Texts, which do refer to the Person and Office of the *Messiah*, pointed at in the Books of the Prophets, they had wit and means enough, as they thought, to elude the force of them by a sinister interpretation; as we see since, they have a (sorry) shift so to do.

Having given this account of his sense concerning the *Septuagint*, and of the Motive inducing the later *Jews* to the Alteration mention'd; he further observes the guilt of the *Samaritans*

tuns of the like Transgression, upon the same account; yet noting withal the difference between them, as a Confutation of each other: Concluding this whole Part, with his Declaration on behalf of the LXX, and the Terms of his Submission; as also with four other Charges against the shorter Reckoning (which seem very important;) and with Reflexions on what *Petavius* hath done in defence of the *Vulgar Latin*; and of what Bishop *Usher*, in defence of the *Masora*: Shewing withal a perfect Agreement of the *Septuagints* Reckoning with the Memorials of Secular History, *Chinensian*, *Chaldæan*, *Ægyptian*. And so much of the *Second* Part.

The *third* and last Part, which is *Canonical*, (as the first hath been *Didactical*, and the second, *Apodeictical*,) is drawn much after the Pattern of *Helvicus* the *German* Chronologer, (as is owned by the Author himself) which is one of the most comprehensive and best Forms that is extant.

II. *A TOUCH-STONE for Gold and Silver Wares, or, a Manual for Gold-smiths, and all other persons, whether Buyers, Sellers or Wearers of any manner of Gold-Smiths work*, &c. *By* W. B. *of* London *Gold-Smith, in* 8°.

I Think my self obliged to take notice of this piece, in regard *of* the honesty and ingenuity of the Author; *of* the curious Art; *of* the weighty concernments universally to all men; and for a proper Adjunct to Mr. *Boyles* Essay-Instrument, described N. 115, *p.* 329. and in reference to an Advertisement on the same, published N. 116. 353. The Author discovers herein the Rules belonging to the Mystery of all sorts of *Goldsmiths* work; and the way and means to know adulterated Wares from those that be of the true standard-Allay; and what are the true Weights appointed for the same: Together with the Statutes now in force for Regulating Abuses committed in that Craft; as also the Charter of the *Gold-smiths* Incorporation, taken from the Record, and truly rendred into *English*. To which are annexed the Laws in force against *Brass-Hilts*, and *Brass-Buckles*; with Directions for discovering the counterfeit Coyn of this Kingdom, and also a Catalogue of the *Forrain* Coyns, with the particular Weights, Allay, and Value of each Coyn.

It were a blessed work, if the Wares of all *Gold-smiths* in all our Cities, Towns, and Villages, were frequently examined by Authority; since 'tis believed, that there are too many notorious Cheats, from the *Massy-Plate* to the *Wedding Ring*, *Thimble* and *Bodkin*; so that the harmless *Milk-maid* can hardly escape a fraud on a Fair-day.

The

Beginning the *Thirteenth year.*

PHILOSOPHICAL TRANSACTIONS.

March 25. 1677.

The CONTENTS.

The Preface to the Thirteenth *year of these Tracts. Some Observations and Advertisements, tending to improve Gardens and other Land. Observations concerning various little Animals, in great numbers discover'd by Mr.* Leewenhoeck *in Rain- Well- Sea- and Snow-water, as also in water wherein Pepper had lain infused. Some new Observations made by Signor* Cassini *concerning the two Planets about* Saturn, *not long since discover'd by the same. An Account of some Books:* I. *PHARMACOPOEIA Collegii Regalis Londini;* II. *Catalogus PLANTARUM ANGLIÆ, &c. Edit. secunda; operâ* Johannis Raii, *M. A. è Soc. Regia;* III. *Aero-Chalinos, or, A Register of the Air, &c. Edit. secunda: By* Nathan. Henshaw *M. D. Fellow of the Royal Society;* IV. *A Philosophical Essay of* Musick.

A Preface to March 25. 1677.

I Have little to say for a Preface *to this my* Twelfth *Volume (which by the Divine Assistance I now begin:) For that so many of the chief Universities in Christendom have already formed themselves into Philosophical Societies; and have so largely contributed their Aydes to advance the Lord* Bacons *Design for the Instauration of Arts and Sciences, that it is now become above my abilities to direct or propose those rare and excellent things, which are suggested to many worthy Authors by their own happy Genius.*

Many useful Inventions are already brought to perfection, and published; and many more are dextrously commenced.

In the Preface to my last foregoing Volume, I sollicited for Natural Histories of Countries: And now I see very much done in that kind; and I hear of much more in the hands of many judicious Philosophers, learned Gentlemen, industrious Students, and noble Travellers. And ingenious Travellers are now furnished with extraordinary accommodations, that were not known to former Ages; such as Thermometers, Baroscopes, Hygroscopes, Microscopes, Telescopes, Micrometers, *exact* Scales *and* Weights, *promptly to weigh Liquors, and, with other circumstances, to examine the intrinsic value of all Coins and Medals or Metals*; Pendulum Watches, *Instruments and Indexes for Magnetical Variations, and Inclinatory Needles, and other helps to come to ascertain Longitudes; and other Mechanical Contrivances for manifold Uses. And every branch of Mathematicks, pure and mixt, Arithmetick, Geometry, Astronomy, Architecture, all Ingenuous Arts are daily rendred more easie and more pregnant.*

These the most Intelligent and Industrious, being some of them in full Bodies associated, well setled and devoted for solid Truth in all our best Academies; and others led by their own Genius and Affairs, to undertake inquisitive Journeys by Sea and Land; we cannot suspect a Relapse, nor fail of a perpetual Progress in sound and useful knowledge, to the satisfaction of all the Ingenuous.

Some Agrestic Observations and Advertisements, from Dr. John Beale *communicated to the Publisher.*

IN *Devonshire* they mingle black Mulberies fully ripe, with a full bodied Cider in the time of grinding or pressing the Apple, with discretion for tincture and relish: And there they esteem it a very wholsom and stout wine. Of this Mulbery-cider, some notice was given from *Devonshire* long since, as may be seen in the *Phil. Transact. Vol.* 2. *Numb.* 27. *p.* 503. *Sept.* 1667.

'Tis strange, that in nine or ten years since this was published, the practise hath not been spread into other Countries, where they abound with strong and winy Cider; many being willing that their Cider should in tincture resemble Claret, Tent, or Alicant wine.

But it may seem, that we do yet retain somewhat of our Fathers aversness from planting Mulberies, which they shewed near the begining of King *James* his Reign, to our great loss and shame.

ſhame. This Ingenious and Learned Kings moſt obliging and admirable Letter to all the Lords and Deputies Lieutenants, and to all the Gentry and Ingenious, may yet be ſeen in *Hartlibs Legacy*, 14*th*. *Defic*. *p*. 59. *edit*. 4*e*.

Of this I am ſure (for I had a hand in promoting it with Mr. *Hartlib*, *An*. 1651, 52, 53.) that Silkworms will proſper and work very kindly in *England*, as far as they were tried. In the North of *Cheſhire* and in *Huntingtonſhire*, and in *Ireland* in the County of *Cavon* in *Ulſter*, a moiſter place than moſt parts of *England*, ſome of my acquaintance gathered from their own Silkworms, ſilk enough to knit for themſelves gloves, ſtockins, and waſtcoats of ſilk. The want of Mulberies was only then their diſcouragement; which did put them to make unproſperous trials upon other leaves: I think, the Raſpy-leaf and Strawbery-leaf was leaſt hurtful to the worms, but none beſides Mulbery-leaves ſufficient for their work.

And the faireſt Mulbery, both for the fruit and for the liquor, and the Marmalade they made of it, were in higheſt eſteem in *Italy* when *Rome* was in her height for luxury; generally prefer'd before any fruit they had entertain'd from *Africa* or *Aſia*, or other parts of their wide Dominions, ſome hundreds of years before they had any thought of *Aurelian* ſilk in *Italy* or *Naples*. I will prove it:

Cùm canis Erigones flagrans Hyperionis æſtu
Arboreos aperit fœtus, cumulataque moris
Candida ſanguineo manat fiſcella cruore,
Tunc præcox biferâ deſcendit ab arbore ficus,
Armeniiſque, & cæreolis, pruniſque Damaſci
Stipantur calathi, & pomis quæ barbara Perſis
Miſerat ——

Here the Mulbery hath the precedence before the faireſt Fig, the Abricot, Prunes of the beſt ſorts, and the Peach which (he ſaith) had forſaken the noxiouſneſs which it had in *Perſia*, by the change of ſoyl in *Italy*.

Ambroſios præbent ſuccos oblita nocendi.

He goes on with other Pavies or Peaches from *Perſia*, and other fruits in higheſt eſteem.

And *Palladius* (at leaſt 200 years after *Columella*) teacheth to make the Quidenie of Mulberies, called Diamoron, of the Juice of Mulberies, without any other mixture, only boyled

with hony(they had no other ſugar then,for their Marmalades) to a conſiſtence. *Tunc duas partes ſucci ipſius & unam mellis miſcebis,& miſta curabis ad pinguedinem mellis excoquere, Pall. Sept. tit.* 16. And he ſhews, how the Mulbery may be graffed on the Fig;and how propagated beſt rather by the offset or truncheon, than by the ſpade; *Mori naſcuntur, ex ſemine, ſic & poma & virgulta degenerant. Serenda eſt taleis vel cacuminibus, melius autem taleis ſeſquipedalibus, ac ſimo oblitis*; *Feb. Tit.* 25. *Conſtantine* confirms the ſame, *l.* 10.*c.*69. & 70. *Palladius* (in the laſt recited place,)ſhows how the Mulbery may be graffed on the Fig, or the faireſt Mulberies on the Vulgar, only by graffing within the rind: *Inſeritur inſico,& in ſe tantum ſub cortice.* He was an illuſtrious perſon, and had large Mannors or Territories in *Italy*, *Naples*, and *Sardinia*; and he omits nothing of worth; yet neither he, nor any one of the ancient Greeks and Latins, hath ſo much as a hint of the Silken trade. The Mulbery requireth a rich, ſucculent and rank ground, which is not wanting in the approaches of any of our Cities and Towns, And Mr. *Evelyn* hath written as well as can be written, both to inſtruct, and to encourage the planting of Mulberies, *Sylva ch.* 9. 2*d*. *Edit.* And this is a ſeaſonable and ſufficient hint for Gardners and Nurſery-men, particularly for thoſe that have good and ſtrong Cider.

The white Mulberies (as we call them) are for the fineſt ſilk; but for our preſent intentions, *to mingle with Cider*, and *for our Junkets*, (as *Palladius* hath hinted to us) we ſhould ſend for the moſt delicious Mulberies, which may be had in *Naples*, *Sicily*, *Virginia*, or any of the *Eaſt* or *Weſt-Indies*: Not truſting to the Seed, for the cautions we have from *Conſtantine l.* 10. *c.* 69. and from *Palladius*, *Febr. Tit.* 25. *Morus*; but by all means, to have young Plants of the beſt ſorts, ſent in boxes, containing ſome of the connatural ſoyl. Thus, if the Gardens about *London* were well furniſh't,they might eaſily be diſperſed into other parts, without more ado: For,few plants may be more eaſily propagated, when they are young. A few rooted Mulberies, being preſs'd down, and cover'd with earth in fit places,ſo that the eyes may be very lightly cover'd,and the ſprouts or branches(if there be any)may be cut very near to the ground; or a good branch, after due depth of the bigger end in the rich mold,thus order'd as before,will ſoon become a perpetual Nurſery,

fery. And if the worſt Mulberies were well diſperſed, they may be ſoon amended by putting the largeſt black Mulbery upon that of the ſmall kind; it being certain, that it takes better upon that, than upon the white Mulbery, ſaith the experienced *Le Gendre*, where he directs the moſt agreable Graffings and Inoculations, *p.* 53. If it be objected, That 'tis a tedious curioſity to ſend ſo far for the ſweeteſt Mulberies and the moſt vinous: I anſwer, that ſome good men may be of another judgment; and very few were hitherto aware of our twofold concernment, which is here demonſtrated experimentally. And every year we have many Exotics (at great charges, and of much leſs worth) imported; too many, meerly to be conſumed here, and to excite and foment luxury: whereas theſe are permanent amongſt us, and to be propagated in all parts for the great benefit of all *England*. And all that are hearty for the Advancement of their own Nurſeries, may for their own profit, take (under the ſame care) this, and all the uſeful Vegetables herein mentioned.

2. This is the ſeaſon to plant and propagate by ſeed, ſuckers, offsets, ſlips, truncheons, or to graff (as is beſt agreable to the ſeveral kinds) the Portugal Quince, the faireſt Warden, the two ſorts of French Cheſtnuts, the largeſt Welſhnut, or Walnut, the beſt Filberds which are ſweeter to many than the Jordan Almond, (and Almonds and excellent Figs do grow here kindly by a little help of a ſunny bank,) and the black cluſter Grape, and the beſt white Grape, and many other Grapes fit for our Climate, both for food and for wine. *Columella* ſhows *l.* 3. 9. *quomodo Amineas feraces facias*; how one excellent Vine may be propagated all over a Province ſpeedily; how in two years, two acres of Vineyards were fully ſtored from one Vine by graffing, and to an incredible abundance of wine. Great choice of all theſe, and of many other excellent, fruitful and delicious plants may be had from the *London* Gardiners for all *England* & *Wales*.

3. Vinous ſhrubs are now coming into faſhion; of theſe do ſome make Sugar-wines by art, to be compared (for wholeſomneſs and pleaſantneſs to many palates) with rich wines of the Grape. For the *Sugarcane* doth hardly yield to any Vine in the world, or other Plant, ſaith *Ligon* (a man of a judicious guſt) *p.* 85. and Mr. *J. W.* in his *Vinet. Brit.* hath well recommended theſe *Vinetum*-ſhrubs, and directed the manner of making and ordering theſe Vines; and (God willing) it ſhall ſhortly be more fully,

ly, or at leaſt in greater variety, directed by the experience and approbation of Perſons of Honour & of curious judgment. Good choice may be had of theſe Plants from Mr. *R. Ball* of *Brainford* for the Weſtern Road; and we hope, their Meath, Metheglin, and their Hony-drinks will in a ſhort time give place to theſe Sugar-wines, when perfectly well made; Hony being better for the Apothecaries, and far dearer than Sugar, if ſome joyn to buy ſugar in groſs, 1000r 2001. weight at a time, or more, immediately from the *American* Merchants. And beſides, 'tis good imployment for poor women and children to gather the fruit; and a ſpecial improvement of our waſte Lands and Heaths by the help of the Plough and Spade, only by turning the Turf, and burnt Heath, (if there be any) into the trenches or pits made by the Plough or Spade, for banks or beds. Doubtleſs *Diamorum* abovementioned will be much amended by ſugar, inſtead of hony then uſed.

4. And ſince ſome parts of *England* have yet need of Importunity for hortulan improvements, I beg leave to tranſcribe out of the *Gazetts*, as follows: *Garden ſeeds* of all ſorts may be had in ſmall or great quantities, of Mr. *Yard*, at the *Red Croſs* and *Golden Lyon* in *Soper lane* near *Cheapſide*; the ancient place for Garden ſeeds in *London*.

5. *Hopclover*, or the largeſt *Trefoil*-ſeed, which is ſaid to improve Lands not worth ſix ſhillings *per* acre, for paſture, to be worth twenty, or thirty ſhillings (mentioned in *Phil. Tranſ. Vol.* 3. *N.* 37. *p.* 725.) is cleanſed from the huſk, and other ſeeds, by Mr. *R. Hainers* of *Sullington* in *Suſſex*; and may be had at the *Croſs Keys* in *Lumbard-ſtreet*, or at the *Naked Boy* in the *Strand*, with a Bill directing the uſe of it. And the ſame Hopclover-ſeed, from the firſt years huſked ſeed, and cleaned from all courſe Graſs-ſeed, may be had from Mr. *Jacob Bobert* Junior, in the *Phyſick Garden* at *Oxford*; and of Mr. *George Sidley* Sadler, at the *Falcon* in *Fleet-ſtreet*, where likewiſe very good *St. Foine* may be had. And I hope, and pray heartily, that this may be the bleſſed ſeaſon, in which our Right Honorable and worthy Patriots, ſhall deviſe & countenance ſuch Expedients, as themſelves ſhall judge to be moſt effectual to recover and revive our Domeſtic Trade, and to promote Real Improvements all over *England* and *Wales*.—*The reſt of this Letter is reſerved for the Tract of April, that the Reader may not fail of variety.*

Ob.

Obſervations, communicated to the Publiſher by Mr. Antony van Leewenhoeck, *in a Dutch Letter of the 9th of* Octob. 1676. *here Engliſh'd: Concerning little Animals by him obſerved in Rain-Well-Sea- and Snow-water; as alſo in water wherein Pepper had lain infuſed.*

IN the year 1675. I diſcover'd living creatures in Rain water, which had ſtood but few days in a new earthen pot, glaſed blew within. This invited me to view this water with great attention, eſpecially thoſe little animals appearing to me ten thouſand times leſs than thoſe repreſented by Monſ. *Swamerdam*, and by him called *Water-fleas* or *Water-lice*, which may be perceived in the water with the naked eye.

The *firſt* ſort by me diſcover'd in the ſaid water, I divers times obſerved to conſiſt of 5, 6, 7, or 8 clear globuls, without being able to diſcern any film that held them together, or contained them. When theſe *animalcula* or living Atoms did move, they put forth two little horns, continually moving themſelves: The place between theſe two horns was flat, though the reſt of the body was roundiſh, ſharpning a little towards the end, where they had a tayl, near four times the length of the whole body, of the thickneſs (by my Microſcope) of a Spiders-web; at the end of which appear'd a globul, of the bigneſs of one of thoſe which made up the body; which tayl I could not perceive, even in very clear water, to be mov'd by them. Theſe little creatures, if they chanced to light upon the leaſt filament or ſtring, or other ſuch particle, of which there are many in water, eſpecially after it hath ſtood ſome days, they ſtook intangled therein, extending their body in a long round, and ſtriving to diſ-intangle their tayl; whereby it came to paſs, that their whole body lept back towards the globul of the tayl, which then rolled together Serpent-like, and after the manner of Copper- or Iron-wire that having been wound about a ſtick, and unwound again, retains thoſe windings and turnings. This motion of extenſion and contraction continued a while; and I have ſeen ſeveral hundreds of theſe poor little creatures, within the ſpace of a grain of groſs ſand, lye faſt cluſter'd together in a few filaments.

I alſo diſcover'd a *ſecond* ſort, the figure of which was oval; and I imagined their head to ſtand on the ſharp end. Theſe were a little bigger than the former. The inferior part of their body is flat, furniſhed with divers incredibly thin feet, which moved very

very nimbly, and which I was not able to discern till after several Observations. The upper part of the body was round, and had within, 8, 10, or 12 globuls, where they were very clear. These little Animals did sometimes change their figure into a perfect round, especially when they came to lye on any dry place. Their body was also very flexible; for as soon as they hit against any the smallest fibre or string, their body was bent in, which bending presently also yerked out again. When I put any of them on a dry place, I observ'd, that changing themselves into a round, their body was raised pyramidal-wise with an extant point in the middle, and having lain thus a little while with a motion of their feet, they burst asunder, and the globuls were presently diffus'd and dissipated, so that I could not discern the least thing of any film, in which the globuls had doubtless been inclosed: And at this time of their bursting asunder I was able to discover more globuls than when they were alive.

But then I observ'd a third sort of little Animals, that were twice as long as broad, and to my eye yet eight times smaller than the first. Yet for all this, I thought I discern'd little feet, whereby they moved very briskly, both in a round and streight line.

There was, further, a *fourth* sort, which were so small, that I was not able to give them any figure at all. These were a thousand times smaller than the eye of a big Louse: For I judge, the *axis* of the eye of such a Louse to be more than ten times as long as the axis of any of the said little creatures. These exceeded all the former in celerity. I have often observ'd them to stand still as 'twere upon a point, and then turn themselves about with that swiftness, as we see a Top turn round, the circumference they made being no bigger than that of a small grain of Sand; and then extending themselves streight forward, and by and by lying in a bending posture.

I discover'd also several other sorts of Animals, but these were very big respectively; of which I intend not to speak here; only this, that they were generally made up of such soft parts, as the former, they bursting asunder as soon as they came to want water. *Observ.* II.

The 26. *May*, it rained hard; the rain growing less, I caused some of that Rain-water, running down from the house-top, to be gather'd in a clean Glass, after it had been washed two or three

three times with the water. And in this I obſerv'd ſome few very little living creatures, and ſeeing them, I thought they might have been produced in the leaden-gutters in ſome water, that had there remain'd before. *Obſerv.* III.

On the ſame day, the Rain continuing, I took a great Porcelain-diſh, and expoſed it to the free Air upon a wooden veſſel, about a foot and a half high, that ſo no earthy parts, from the falling of the Rain-water upon that place, might be ſpatter'd or daſhed into the ſaid diſh. With the firſt water that fell into the diſh, I waſhed it very clean, and then flung the water away, and receiv'd freſh into it, but could diſcern no living creatures therein; only I ſaw many irregular terreſtrial parts in the ſame.

The 30. of *May*, after I had, ever ſince the 26*th*, obſerv'd every day twice or thrice the ſame Rain-water, I now diſcover'd ſome, yet very few, exceeding little Animals, which were very clear.

The 31*th* of *May*, I perceived in the ſame water more of thoſe Animals, as alſo ſome that were ſomewhat bigger. And I imagine, that many thouſands of theſe little Creatures do not equal an ordinary grain of Sand in bigneſs: And comparing them with a Cheeſe-mite (which may be ſeen to move with the naked eye) I make the proportion of one of theſe ſmall Water-creatures to a Cheeſe-mite, to be like that of a Bee to a Horſe: For, the circumference of one of theſe little Animals in water, is not ſo big as the thickneſs of a hair in a Cheeſe-mite

Obſerv. IV.

June 9*th*, having received, early in the morning, ſome Rain-water in a diſh, as before, and poured it into a very clean Wine-glaſs, and expoſed it about 8 of the clock in the morning to the Air, about the height of the third ſtory of my houſe, to find, whether the little Animals would appear the ſooner in the water, thus ſtanding in the Air:

Obſerving the ſame accordingly the 10*th* of *June*, I imagin'd, I ſaw ſome living creatures therein; but becauſe they ſeem'd to be but very few in number, nor were plainly diſcernable, I had no mind to truſt to this obſervation.

The 11*th* of the ſame month, ſeeing this water move in the Glaſs from a ſtiff gale of wind (which had blown for 36 hours without intermiſſion, accompanied with a cold, that I could very well endure my Winter-cloaths,) I did not think, I ſhould then perceive any living creatures therein; yet viewing it at-

tentively, I did, with admiration, obſerve a thouſand of them in one drop of water, which were of the ſmalleſt ſort, that I had ſeen hitherto.

The 12*th* of *June*, the wind being at weſt, the Sun ſhining with interloping clouds, I viewed the ſame Rain water, and found the fore-mention'd little Animals ſo plentifully in the water which I took up from the ſurface, that one or two thouſand in one ſingle drop did not make up their number.

The 13*th* of the ſame month, viewing the ſame water again, I found, beſides the Animals already noted, a ſort of creatures, that were eight times as big as they, of almoſt a round figure: And as thoſe very ſmall *animalcula* did ſwim gently among one another, moving like as Gnats do in the Air; ſo did theſe bigger ones move far more ſwiftly, tumbling round as 'twere, and then making a ſudden downfall.

The 14*th* of *June* I did find theſe very little creatures in no ſmaller number. The 16*th*, I ſaw them as before; and this water, which had been, in all, $\frac{1}{8}$ of a pint, being now more than half dryed up, I flung it away. *Obſerv.* V.

The 9*th* of *June*, I put of the ſame Rain-water in a very clean Wine-glaſs in my Counter or Study, and viewing the ſame, I perceived no living creatures in it.

Note, that my Study ſtands toward the North-eaſt, in my Anti-chamber, and is very cloſe, joyned together with Wainſcot, having no other opening than one hole of an inch and a half broad, and 8 inches long, towards the ſtreet furniſht with 4 windows, of which the two lowermoſt open inwards, and by night are cloſed with two wooden Shuts; ſo that there comes in but little Air from without, unleſs it be that I uſe a candle in making my Obſervations, in which caſe I lift up a little Caſement, that the ſteam of the candle may not offend me; but yet drawing a Curtain at that time over almoſt all the windows.

The 10*th* of *June*, obſerving the mentioned Rain-water, which now had ſtood 24 hours in my ſtudy, I noted ſome few very ſmall living creatures, in which, by reaſon of their extream minuteneſs, I could ſee no figure, and among the reſt I diſcover'd one that was ſomewhat greater, of an oval figure,

Note, that when I ſay, I have view'd the water, I mean, that I have view'd only 3, 4, or 5 drops of the water, which I alſo flung away.

The

The 11*th* of *June*, looking upon this water afresh, I saw the said little creatures again, but there were then but very few of them.

The 12*th*, I saw them as the day before; besides, I took notice of one figured like a Mussel-shell, with its hollow-side downwards, & it was of a length equal to the eye of a louse.

The 13*th*, early, I discover'd the extream small creatures in greater number, and among them I saw a bigger one, as I did before. In the evening of the same day I saw the same very small insects again in no less number, taking notice, that the same had a transparent part standing out behind: I discover'd also some little animals which were somewhat longer than an oval, and these were about six times as big as the extream small creatures: Their head, which run out somewhat in length, they often drew in, and then appear'd to be almost round I perceived also some that were altogether round, and the *axis* of these was twice as long as that of the smalleſt creatures. These two greater sorts were very flexile, so that their body did bend at the touch of the least and finest filament.

The 14 of *June* I perceived the oval insects in greater plenty.

The 16. I saw them in yet greater numbers; and they were flat beneath, and round above; and besides, I noted very small creatures, that were three times as long as they were broad: And divers other sorts, too long to describe here. And in the evening of the same day, I discover'd little feet in the small oval creatures, which were many in number; as also a much bigger creature of the same figure, which was likewise furnished with legs. And here I gave over my Observations as to this water.

Observ. VI.

The 17*th* of this month of *June* it rained very hard; and I catched some of that Rain-water in a new Porcelain dish, which had never been used before, but found no living creatures at all in it, but many terrestrial particles, and, among others, such as I thought came from the smoak of Smiths-coals, and some thin thrids, ten times thinner than the thrid of a Silk-worm, which seem'd to be made up of globuls; and where they lay thick upon one another, they had a green colour.

The 26*th*, having been eight days out of Town, and kept my Study shut up close, when I was come home and did view the said water, I perceived several *animalcula*, that were very small. And

herewith I desisted from making at this time any further Observations of Rain-water.

Mean time, this Town of *Delft* being very rich in water, and we receiving from the River of *Maase* fresh water, which maketh our water very good; I viewed this water divers times, and saw extream small creatures in it, of different kinds and colours; and even so small, that I could very hardly discern their figures: But some were much bigger, the describing of whose motion and shape would be too tedious: This only I must mention here, that the number of them in this water was far less than that of those, found in Rain-water; for if I saw a matter of 25 of them in one drop of this Town water, that was much.

In the open Court of my house I have a well, which is about 15 foot deep, before one comes to the water. It is encompassed with high walls, so that the Sun, though in *Cancer*, yet can hardly shine much upon it. This water comes out of the ground, which is sandy, with such a power, that when I have laboured to empty the well, I could not so do it but there remained ever a foots depth of water in it. This water is in Summer time so cold, that you cannot possibly endure your hand in it for any reasonable time. Not thinking at all to meet with any living creatures in it, (it being of a good taste and clear) looking upon it in *Sept.* of the last year, I discover'd in it a great number of living animals very small, that were exceeding clear, and a little bigger than the smallest of all that I ever saw; and I think, that in a grain weight of this water there was above 500 of those creatures, which were very quiet and without motion.

In the Winter I perceived none of these little animals, nor have I seen any of them this year before the month of *July*, and then they appear'd not very numerous, but in the month of *August* I saw them in great plenty.

July 27. 1676. I went to the Sea-side, at *Schevelingen*, the wind coming from Sea with a very warm Sun-shine; and viewing some of the Sea-water very attentively, I discover'd divers living animals therein. I gave to a man, that went into the Sea to wash himself, a new Glass-bottle, bought on purpose for that end, intreating him, that being on the Sea, he would first wash it well twice or thrice, and then fill it full of the Sea-water; which desire of mine having been complied with, I tyed the bottle close with a clean bladder, and coming home, and viewing it, I

saw

in it a little animal that was blackish, looking as if it had been made up of two globuls. This creature had a peculiar motion, after the manner as when we see a very little flea leaping upon a white paper; so that it might very well be called a Water-flea; but it was by far not so great as the eye of that little animal, which Dr. *Swammerdam* calls the Water-flea. I also discovered little creatures therein, that were clear, of the same size with the former animal which I first observed in this water, but of an oval figure, whose motion was Serpent-like. I took further notice of a third sort, which were very slow in their motion: Their body was of a Mouse-colour, clear towards the oval-point; and before the head, and behind the body there stood out a sharp little point angle-wise. This sort was a little bigger. But there was yet a fourth sort somewhat longer than oval. Yet of all these sorts there were but a few of each, so that in a drop of water I could see sometimes but three or four, sometimes but one.

July 31. after I had from the 27. of this month viewed this water every day, but perceived no little animals in it, looking upon it now, I saw an 100, where before I had seen but one; but these were of an other figure, and not only lesser, but they were also very clear, and of an oblong oval figure, only with this difference, that me thought their heads ended sharper: And although they were a thousand times smaller than a small grain of sand, yet I discern'd, that when they lay out of the water in a dry place, that they burst in pieces & spred into 3 or 4 very little globuls, and into some aqueous matter, without my being able to discern any other parts in them.

The 2*d* and 4*th* of *August* I saw many of the aforesaid small animals: but the *6th* and *8th*, I did not by far perceive so many of them as before. And those few ones I saw the *8th*, were so very smal, that even by my Microscope they were hardly discernible.

Observations of water, wherein whole Pepper had layn infused several dayes.

1. Having several times endeavoured to discover the cause of the pungency of *Pepper* upon our tongue, and that the rather, because it hath been found, that though Pepper had lain a whole year in vinegar, yet it retained still its pungency; I did put about $\frac{1}{3}$ of an ounce of whole pepper in water, placing it in my Study, with this design, that the pepper being thereby rendred soft, I might be enabled the better to observe what I proposed

to

to my self. This pepper having lain about 3 weeks in the water, to which I had twice added some Snow-water, the other water being in great part exhaled; I looked upon it the 24 of *April*, 1676. and discern'd in it, to my great wonder, an incredible number of little animals, of divers kinds; and among the rest, some that were 3 or 4 times as long as broad; but their whole thickness did, in my estimation, not much exceed that of the hair of a Louse. They had a very pretty motion, often tumbling about and sideways; and when I let the water run off from them, they turned as round as a Top, and at first their body changed into an oval, and afterwards, when the circular motion ceased, they returned to their former length.

The 2*d* sort of creatures, discover'd in this water, were of a perfect oval figure, and they had no less pleasing or nimble a motion than the former; and these were in far greater numbers. And there was a 3*d* sort, which exceeded the two former in number; and these had tails also, like those I had formerly observ'd in Rain-water.

The 4*th* sort of creatures, which moved through the 3 former sorts, were incredibly small, and so small in my eye, that I judged, that if 100 of them lay one by another, they would not equal the *length* of a grain of course Sand; and according to this estimate, ten hundred thousand of them cou'd not equal the dimensions of a *grain* of such course Sand.

There was discover'd by me a fifth sort, which had near the thickness of the former, but they were almost twice as long.

2. The 26*th* of *April*, I took $2\frac{1}{2}$ ounces of Snow-water, which was about three years old, and which had stood either in my Cellar or Study in a Glass-bottle well stopped. In it I could discover no living creatures: And having poured some of it into a Porcelain Thea-cup, I put therein half an ounce of whole pepper, and so placed it in my Study. Observing it daily until the 3*d* of *May*, I could never discover any living thing in it; and by this time the water was so far evaporated, and imbibed by the pepper, that some of the pepper-corns began to lye dry. This water was now very thick of odd particles; and then I poured more Snow-water to the pepper, until the pepper-corns were cover'd with water half an inch high. Whereupon viewing it again the fourth and fifth of *May*, I found no living creatures in it; but the sixth, I did very many, and those exceeding small

ones,

ones, whose body seem'd to me twice as long as broad; but they moved very slowly, and often round-ways.

The *7th*, I saw them yet in far greater numbers.

The *10th* I put more Snow-water to the pepper, because the former was again so exhaled, that the pepper-corns began to be dry again.

The *13th* and *14th*, I saw the little creatures as before; but the *18th*, the water was again so dryed away, that it made me pour on more of it. And the *23th*, I discover'd, besides the aforesaid little animals, another sort, that were perfectly oval, and in figure like Cuckow-eggs. Me thought, the head of them stood on the sharp end: Their body did consist, within, of 10, 12, or 14 globuls, which lay separate from one another. When I put these *animalcula* in a dry place, they then changed their body into a perfect round, and often burst asunder, & the globuls, together with some aqueous particles, spred themselves every where about, without my being able to discern any other remains. These globuls, which in the bursting of these creatures did flow asunder here and there, were about the bigness of the first very small creatures. And though as yet I could not discern any feet in them, yet me thought, they must needs be furnished with very many, seing that the smallest creatures, which I said before to be very plentiful in this water, and lay sometimes more than an 100 of them on one of the oval creatures, were by the motion, made in the water by the great ones (though to my eye they seem'd to lye still) driven away by them, in the manner as we blow away a feather from our mouth. Of the same oval creatures I never could discover any very little ones, how attentive soever I was to observe them.

The *24th* of *May* observing this water again, I found in it the oval little animals in a much greater abundance. And in the evening of the same day, I perceived so great a plenty of the same oval ones, that 'tis not one only thousand which I saw in one drop; and of the very small ones, several thousands in one drop *.

* *This* Phænomenon, *and some of the following ones seeming to be very extraordinary, the Author hath been desired to acquaint us with his method of observing, that others may confirm such Observations as these.*

The *25th*, I saw yet more oval creatures: And the *26th*, I found so vast a plenty of those oval creatures, that I believe, there were more than 6 or 8000 in one drop; besides the abundance of those very little animals, whose number was yet far greater.

This

This water I took from the very ſurface; but when I took up any from beneath, I found that not ſo full of them by far. Obſerving, that theſe creatures did augment into vaſt numbers, but not being able to ſee them increaſe in bigneſs, I began to think whether they might not in a moment, as 'twere, be compoſed or put together: But this ſpeculation I leave to others.

The 26*th* of *May* at night, I diſcern'd almoſt none of the little creatures, but ſaw ſome with tayls, of which I have ſpoken heretofore, to have ſeen them in Rain-water: But there drove in the water throughout an infinity of little particles, like very thin hair, only with this difference, that ſome of them were bent.

The 27*th* I perceived none at all of the little animals, but great number of the bigger. The 28*th*, all ſorts of thoſe living creatures in this peppery water were grown thinner But the 30*th*, I ſaw very few living creatures in the water, and where I now ſaw but one, I had ſome days ago ſeen a hundred. And by this time the water was ſo dryed away, that the pepper began to lye bare. And then I fill'd my Thea-diſh with Snow-water again.

June 1. the living creatures appear'd again in ſo great abundance, as I had ever ſeen before; but, as to thoſe very ſmall ones, I cannot ſay that I ſaw them. Thoſe I ſaw, I could now diſcern to be furniſh't with very thin legs, which was very pleaſant to behold.

The ſame day I diſcover'd a few of the very ſmall creatures, which were almoſt 8 times as big as the ſmalleſt of all. Theſe had ſuch a ſwift motion through the others, that 'tis incredible. Thoſe bigger animals, that were about 8 times ſmaller than the eye of a Louſe, were in no ſmaller number.

3. *May* the 26*th*, I took about $\frac{1}{3}$ of an ounce of whole pepper and having pounded it ſmall, I put it into a Thea-cup with $2\frac{1}{2}$ ounces of Rain-water upon it, ſtirring it about, the better to mingle the pepper with it, and then ſuffering the pepper to fall to the bottom. After it had ſo ſtood an hour or two, I took ſome of the water, before ſpoken of, wherein the whole pepper lay, and wherein were ſo many ſeveral ſorts of little animals; and mingled it with this water, wherein the pounded pepper had lain an hour or two, and obſerved, that, when there was much of the water of the pounded pepper, with that other, the ſaid animals ſoon died, but when little, they remained alive.

June 2. in the morning, after I had made divers Obſervations ſince the 26*th* of *May*, I could not diſcover any living thing, but

ſaw

saw some creatures, which tho they had the figures of little animals, yet could I perceive no life in them, how attentively soever I beheld them.

The same day at night, about 11 a clock, I discover'd some few living creatures: But the 3*d* of *June* I observed many more which were very small, but 2 or 3 times as broad as long. This water rose in bubbles, like fermenting beer.

The 4*th* of *June* in the morning I saw great abundance of living creatures; and looking again in the afternoon of the same day, I found great plenty of them in one drop of that water, which were no less than 8 or 10000, and they looked to my eye, through the Microscope, as common sand doth to the naked eye. On the 5*th*, I perceived, besides the many very small creatures, some few (not above 8 or 10 in one drop) of an oval figure, whereof some appear'd to be 7 or 8 times bigger than the rest.

The 6*th*, those animals were as before; but the 8*th*, the oval animals were increased in number, swiming among the said very small creatures; and now they were all very near of one and the same bigness. The 9*th*, the oval creatures appear'd yet in greater numbers, but the very small ones, in less number; and now, using a particular method in observing, I noted, that the feet, wherewith the animals were furnish't, did plainly move, & that with an incredible swiftness: And me thought, that now & then I saw, that the globuls, of which I said that the greatest part of their body was made up, were not perfectly round, but that every one of them had a prominent point. These creatures were, to my eye, eight times smaller than the eye of a Louse.

Some new Observations made by Sig. Cassini *and deliver'd in the* Journal des Scavans, *concerning the two Planets about* Saturn, *formerly discover'd by the same, as appears in N.* 92. *of these Tracts.*

ONe of these 2 Planets, which is distant from the Center of *Saturn* 10 diameters and a half of his Ring, maketh his revolution about *Saturn* in 80 days. He was discover'd at the Parisian Observatory, *A.* 1671. about the end of *Oct.* and in the beginning of *Nov.* in his greatest Occidental digression, and after many cloudy days he ceased to appear, for a reason which was then unknown, but hath been discover'd since. For, after that many revolutions of this small Planet had been observ'd, he was found to have a period of apparent Augmentation & Diminution, by which period he becomes visible in his greatest *Occidental* digression, and invisible in his greatest *Oriental* digression.

It is certain, that this vicissitude of Augmentation and Di-

minution, of appearing and disappearing, doth not befall him upon the account & by reason of the variation of his Distance from the Earth and from the Sun: For, besides that in one revolution of this Planet about *Saturn*, he varies not the hundredth part of his distance; his most sensible diminution appears then, when being in the upper part of his circle he descends towards the lower part, approaching to the Sun and the Earth.

'Tis also certain, that this vicissitude doth not befall him from the different exposition of this Star to the Earth and to the Sun, as it comes to pass in the increase and decrease of the Moon, forasmuch as in this great distance he is always exposed to the Earth and the Sun, as the Globe of Saturn himself, whom we always see full of light, without a sensible difference between the Oppositions and the Quadratures.

But it seems, that one part of his surface is not so capable of reflecting to us the light of the Sun which maketh it visible, as the other part is. Whence we may conjecture, that the Globe of this Satellit hath some diversity of parts analogous to that of the earth, the one part of whose surface is cover'd by the Sea, which is not so fit to reflect from all parts the light of the Sun, as the Continent which maketh up the other part: So that this Planet by a conversion about his Axis, or by an exposition of the same Hemisphere to Saturn (much after the manner of the Hemisphere of the Moon to the Earth,) sometimes turns to us the part analogous to the Continent, somtims that part which answers to the Sea.

This vicissitude of *phases* in this Planet was the cause, that he could not be found since he was first discover'd in the year 1671, till the midst of *Dec.* 1672; after which time he disappeared once again until the beginning of *Febr.* 1673; at which time, having been observ'd 13 days successively, he afforded us the opportunity of determining the period of his motion.

Since that time, as often as Saturn hath been distant enough from the Sun to enable one to discern this Planet, he hath always been seen in all his Occidental Digressions, and in the Conjunctions with Saturn, which have since happen'd with a great latitude, as well in the upper part of his circle as in the lower, & he could never be seen in his Oriental digressions, where he remains invisible in every revolution of 80 days for a whole month together.

He begins then to appear 2 or 3 days *before* his conjunction in the inferior part, and to disappear 2 or 3 days *after* his conjunction in the superior part. And sometimes after he hath begun to disappear in a Telescope of 32 foot, he hath been sought for with a Telescope of 45 foot, but in vain.

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The ſequel of the Obſervations hath confirm'd, that the period of 80 days, which was yet ſomewhat doubtful in the ſecond diſcovery, is ſufficiently juſt, and that he doth not anticipate 9 revolutions, which are made in 2 years, but by one whole day; & that in the Conjunctions with Saturn his Latitude augments on the one and the other ſide, according as the ring of Saturn enlargeth it ſelf; though the line of his motion is not parallel to the circumference of the ring: wch was noted in the firſt Obſervations.

The other Planet, which was diſcover'd about the end of the year 1672, hath his greateſt digreſſion from the Center of Saturn only 1 diameter and 2 thirds of his Ring, and the period of his revolution about Saturn is 4 days and a half, but more preciſely 4 days, 12 hours, & 27 min. His Latitude augments alſo according as the Ring enlargeth, and at the preſent that the largeneſs of the Ring is greater than the Diameter of the Globe of Saturn, he is to paſs in the Conjunctions without touching neither Saturn nor his Ring. Yet notwithſtanding we have not yet been able to diſtinguiſh him in the Conjunctions either in the upper or lower part of his circle; but only in his greateſt, as well Oriental as Occidental, digreſſions. And this Satellit being alternately one day towards his conjunction, and the other day towards his digreſſion, he is ordinarily not ſeen but every third day, and rarely 2 days together, when it falls out that at the hour of Obſervation he is in the middle betwixt the conjunction and digreſſion.

Laſtly, the apparent magnitude of theſe Planets is ſo little, that poſterity will have cauſe to wonder, that their diſcovery was begun by a Glaſs of 17 foot.

And foraſmuch as we have endeavour'd with the ſame attention and care to obſerve, whether there be not the like Planets about *Venus* and *Mars*, and have not been able to find any, even then when their diſtance from the Earth was 20 or 30 times leſs than that of Saturn, it may thence be concluded, that *Venus* and *Mars* have no Satellits, whoſe ſurface enlighten'd by the Sun and expoſed to the Earth is not 20 or 30 times leſs than that of the two Satellits of Saturn, and leſs capable of reflecting the light of the Sun.

An Account of ſome Books:

I. *PHARMACOPOEIA Collegii Regalis Lond. A.* 1677. *in fol.*

THis new Edition, reviewed by the Royal Colledge of the Learned Phyſitians of *London*, hath theſe conſiderable advantages over the former, that great care hath been taken, not only to correct the many Typographical faults committed in the

former Editions, but also to expunge several prescripts conceived to be now useless, and to substitute in their room a good number of others, found acceptable and useful by experience, both as to the Chymical and Galenical Preparations; tending very much to the fuller instruction of the Apothecaries, & consequently to the great benefit of those that are to be serv'd by them.

II. *Catalogus PLANTARUM ANGLIÆ, & Insularum adjacentium, tum Indigenas, tum in agris passim cultas complectens, &c. Edit. secunda*; *operâ* Johannis Raii, *M. A. è Soc. Regia*; Lond. *impensis* J. Martyn *Reg. Soc. Typogr. ad insigne Campanæ in Cæmeterio D.* Pauli, 1677. *in* 8°.

IN this *second* Edition the Accurate and Learned Author hath presented the Curious with a considerable number of Plants not contained in the first; which do amount to about 46; some of which were forgotten in the former Edition, some were newly found out by him. Besides that, here are to be met with not a few useful Observations, which the Author hath partly lighted upon in his reading since, partly received by the communication of his friends. Compare (if you please) what was said of the first Edition of this Catalogue in *N.* 63 of these Tracts, publish'd 1670. in *September.*

III. *Aero Chalinos, or, A Register for the Air, &c. By* Nathan. Henshaw *M. D. Fellow of the R. Society, London*, 1677. *in* 12°.

THis also is a *second* Edition; which we cannot forbear to give some account of now, considering the ingeniosity and usefulness of the discourse therein contained, which was, I know not how, passed over in the first Edition.

The Tract then contains 5 Chapters; the 1*st* is of Fermentation; the 2*d*, of Chylification; the 3*d*, of Respiration; the 4*th*, of Sanguification; the 5*th*, of the Salubrity of frequent changing of Air; together with a discovery of a new Method of doing it, without removing from one place to another, by means of an Air-Chamber fitted to that purpose.

But the main thing, here undertaken by the Learn'd Author, is, that having considered the Air to be of some very general use, and proved great quantity of Air in all mixed bodies, as also that the Air of all simple bodies, is capable of Dilatation or Constriction (or Rarity and Density) by being more or less moved by the presence or absence, the nearness or remoteness of the Sun, he enquireth, Whether all *Fermentation* may not be reduced to this simple motion of the Air, and doth not depend on it, as on a general cause. In the making out of which, if he have not

not failed, he thinks it will be no difficult matter, to reduce all other motions in the world to that of Fermentation, and probably to resolve many hard Questions, not as yet so rightly determined. But because Contemplations of this kind are, in their own nature, very unprofitable, if not reducible to practise; the Author hath endeavour'd to apply the same to the Cure and Prevention of most Diseases.

IV. *A Philosophical Essay of* MUSICK: London, *printed for* J. Martyn, *Printer to the R. Society, at the Bell in St.* Paul's *Church yard*, 1677. *in* 4°.

THis Author's design being to explain the Nature of *Musick*, he begins to inquire into the cause of *Sound*: In order whereunto, he considers some of the chief *phænomena* of *Sound*, as 1. that it may be produced, according to him, in the *Torricellian* vacuity: 2. that it causes motion in Solid bodies, and is diminished by the interposition of solid bodies: 3. that if the bodies interposed are very thick, its passage is wholly obstructed: 4. that it seems to come to the Ear in strait lines when the object is so scituated that it cannot come in a strait line to the ear: 5. that when the Air is not in motion, its extent is *spherical*; and when there is a wind, the *sphere* is enlarged on that part, to which the wind blows, and diminished on the contrary part: 6. that it arrives not to the ear in an instant, but considerably slower than sight: 7. that it comes as quick against the wind as with it, though not so loud nor so far.

Hence he raises the following Hypothesis. He supposes the Air, we breath in, to be a mixture of different minute bodies which are of different sorts and sizes, though all of them are so small as to escape our senses: the *grosser* of them he makes Elastical, and such as are resisted by solid bodies, altogether impervious to them: The *smaller* parts pass *through* solid bodies, tho not with that ease but that upon a sudden and violent start of them, they shock the parts of solid bodies that stand in their way, and also the *grosser* parts of the Air. Lastly, that there may be another degree of most *subtile Ethereal* parts, with which the interstices of these and all other bodies are repleat, which find freer passage every where, and are capable of no compression, and consequently are the medium and cause of the immediate communication of Sight.

Now, of these three, he esteems the middle sort to be the medium and cause of *Sound*, and that at any time, when the *grosser* Air is driven off any space, and leaves it to be possest by these

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and other more subtile bodies, and returns by its elasticity to its former place, then, are these parts extruded with violence as from the center of that place, and communicate their motion as far as the sound is heard. Or, when any solid body is moved with a sudden and violent motion, these parts must be affected thereby: For, as these parts are so much resisted by solid bodies as to shock them; so, on the contrary, they must needs be moved by the sudden starting of solid bodies.

So that (according to him) *Sound* may be caused by the trembling of solid bodies without the presence of *gross* Air; and also by the restitution of gross Air, when it hath been divided with any violence. Thus, (saith he) we see, that a Bell will sound in the *Torricellian* space: And, when the Air is divided with any sudden force, as by the end of a Whip having all the motion of the Whip contracted in it, and by a sudden turn throwing off the Air; or by accension, as in Thunder and Guns; or by any impression of force carrying it where other Air cannot so forcibly follow, as upon compressing of Air in a bladder till it breaks, or in a Pot-gun; a sudden crack will be caused.

Having laid down this Hypothesis, and left his Reader to apply it to the afore-mentioned *phænomena*, he proceeds to the Discourse of *Musick* it self, and maketh it a considerable part of his business to shew, How this Action that causes *Sound*, is performed by the several Instruments of *Musick*; having taught his Reader, *first*, What a *Tone* is, and that the Tones useful in Musick are those within the *Scale*, in which they are placed as they have relation to one another. *Secondly*, wherein consists that Relation of *Tones* & the union of mixt Sounds. Which done, he explains, how *Tones* are produced, and what assistances are given to the *Sound* by *Instruments*. Where he teaches, that wherever a Body stands upon a Spring that vibrates in equal Terms, such a Body, put into motion, will produce a *Tone*, which will be more *grave* or *acute*, according to the velocity of the returns: Wherefore *Strings* vibrating have a *Tone* according to the Bigness or Tension of them; and *Bells* that vibrate by cross Ovals, produce Notes according to the bigness of them, or the thickness of their sides; and so do all other bodies, whose superficies, being displaced by force, results or comes back by a spring which carries it beyond its first station. And here, to make it to be understood, how every pulse upon such vibrations causes Sound, our Author gives us to consider, that the gross Air is thrown off by the violence of the motion, which continues some moments of

time

time after the return of the vibrating Body; whereupon ſome ſpace muſt be left to the ſubtil matter, which upon the reſilition of the Air ſtarts as from a Center; which action being the ſame, by the Author ſuppoſed to be the cauſe of the *Sound*, is repeated upon every vibration.

But finding it more difficult to ſhew, how *Tones* are made by a *Pipe*, where there are no viſible vibrations; he conſiders the Frame of a Pipe, and the Motion of the Air in it, and thereby attempts to find the Cauſe of the *Tone* of a Pipe, and the pulſe that gives the *Sound*: not omitting to explicate, how *Tones* are made in *Violins*, *Harpſecords* and *Dulcimers*.

To this he ſubjoyns an ingenious Diſcourſe of the *Varying* & *Breaking* of Tones, endeavouring to explain, how it is cauſed both in *Strings* and *Pipes*: where occur divers pertinent Obſervations concerning the motion of *Pendulums*, the *Trumpet Marine*, & the *True Trumpet*, as alſo the *Sackbut*. And having ſhew'd, that *Sound* doth cauſe a motion not only of ſolid bodies, but of the groſſer parts of Air within the Sphere of it; he conſiders, that if the Air, which is moved by being incloſed, ſtands upon ſuch a degree of reſiſtance to Compreſſion, that it hath a Spring vibrating in the ſame meaſure with the Sound that puts it into motion, there will be the ſame effect, as when 2 Strings are tuned in Uniſon; that is, the motion will be ſo augmented by ſucceeding regular pulſes, that the incloſed Air may be brought to ring, and produce a *Tone*. Where he taketh notice of the advice of *Vitruvius* in his Architecture, importing, that in the ſtructure of a *Theatre*, there ſhould be vaſes or hollow pots of ſeveral ſizes to anſwer all the Notes of Muſick placed upon the Stage in ſuch manner, that the voice of them which ſang upon the Stage might be augmented by the ringing of them: *Vitruvius* mentioning divers antient Theaters, where ſuch were, in ſome of *Braſs*, in ſome of *Earth*.

After this, he deſcends to the conſideration of the Nature of *Keys* in Muſick, and of a ſingle *Tune*; which later, he ſaith, conſiſts in the ſucceeding Notes having a due relation to the preceding, and carrying their proper emphaſis by length, loudneſs and repetition, with variety that may be agreable to the hearer.

Next, he treats of *Schiſmes* and the *Scale* of Muſick; ſhewing that this Scale is not ſet out by any determinate quantities of whole or half Notes, though the degrees are commonly ſo called; but that the degrees in the Muſical Scale are fixed by the Ear in theſe places, where the pulſes of the *Tones* are coincident, without

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out any regard to the quantity. Here he endeavors to shew, how all the Notes come into the Scale by their Relation and Dignities; whence he thinks it will be obvious, why, for easiness of instruction and convenience, the Scale of Degrees of Musick is made as Musicians now exhibit it.

Having dispatched that work, he proceeds to Musick that consists of several parts in *Consort*, which is made up of *Harmony*, *Formality* and *Conformity*. Of which, *Harmony* is the grateful sound produced by the joyning of several Tones in chord to one another: *Formality* requires, that the succeeding Notes be agreable to the *former*; and *Conformity* will, that each part have the like tendency to the *succeeding* Notes.

Lastly, he speaks of *Time* or the measures of Musick; the due observance of which is grateful for the same reason given for the Formality of a single *Tune*, because the subsequent strokes are measured by the memory of the former, and if they do comprehend them, or are comprehended by them, it is alike pleasant; the mind cannot chuse but compare one with the other, and observe when the strokes are coincident with the memory of the former. Whence it is, that, the less the intervals are, the more grateful is the measure, because it is easily & exactly represented by the memory; whereas a long space of time that cannot be comprehended in one thought, is not retain'd in the memory in its exact measure, nor can abide the comparison, the time past being always shortned by so much as it is removed from the time present.

The whole is concluded by two Observations, by which we shall likewise conclude this Account: 1. That it plainly appears by the Discourse of this Tract, how Musick comes to be so copious; for, considering the species of keys, the number of them, the variety of Chords, the allowable mixing of Discords, the diversity of measure; it is not to be wondred at, that it should, like Language, afford to every Age, every Nation, nay, every Person, particular stiles and modes. 2. That it appears likewise, that *Tones* or *Modes* of Musick in ancient time could not be of other kinds than are now, since there can be no other in nature. Wherefore the great effects it then had, if truly related, must be imputed to the rarity of it, and the barbarity of the people, who are not transported with any thing after it become common to them.

March 29. 1677. Imprimatur, *BROUNCKER*, P. R. S.

London, *Printed for* John Martyn, *Printer to the R. Society*, 1677.

PHILOSOPHICAL TRANSACTIONS.

April 23. 1677.

The CONTENTS.

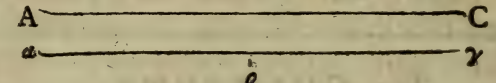
A Letter of Dr. Wallis, *concerning a new Musical Discovery. An Improvement of the* Bononian *Stone, shining in the dark. Extract of a Letter out of* Scotland, *concerning a man of a strange Imitating nature; as also of several human* calculus's, *of an unusual bigness. Mr.* Leewenhoecks *Letter, giving some account of the manner of his observing so vast a number of live Insects in several sorts of water, as was said in the next foregoing Tract. A Continuation of the Hortulan and Rural Advertisements, formerly promised. A Letter of Monsieur* Hevelius, *delivering his Observations, made for several years together, concerning three New Stars. An Account of two Books:* I. *Traité de la PERCUSSION ou CHOQ des CORPS; par Monsieur* Mariotte, *de l'Academie Royale des Sciences, à* Paris. II. Johanni Trithemii *STEGANOGRAPHIA, vindicata, reserata, & illustrata: Auth.* Wolfgango Ernesto Heidel, *Wormatiensi.*

Dr. Wallis's *Letter to the Publisher, concerning a new Musical Discovery; written from* Oxford, *March* 14. $167\frac{6}{7}$.

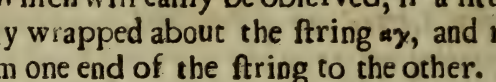
SIR,

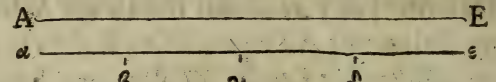
I Have thought fit to give you notice of a discovery that hath been made here, (about three years since, or more) which I suppose may not be unacceptable to those of the *Royal Society*, who are Musical and Mathematical. 'Tis this; whereas it hath been long since observed, that, if a Viol string, or Lute string, be touched with the Bow or Hand, another string on the same or another Instrument not far from it, (if an *Unison* to it,

or an *Octave*, or the like) will at the ſame time tremble of its own accord. The cauſe of it, (having been formerly diſcuſſed by divers,) I do not now inquire into. But add this to the former Obſervation; that, not the whole of that other ſtring doth thus tremble, but the ſeveral parts ſeverally, according as they are Uniſons to the whole, or the parts of that ſtring which is ſo ſtruck. For inſtance, ſuppoſing AC to be an upper Octave to $\alpha\gamma$, and therefore an Uniſon to each half of it, ſtopped at β:

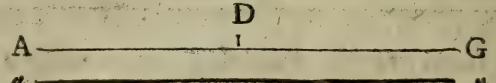


Now if, while $\alpha\gamma$ is open, AC be ſtruck; the two halves of this other, that is, $\alpha\beta$ and $\beta\gamma$, will both tremble; but not the middle point at β. Which will eaſily be obſerved, if a little bit of paper be lightly wrapped about the ſtring $\alpha\gamma$, and removed ſucceſſively from one end of the ſtring to the other. In like manner, if AD be an upper Twelfth to $\alpha\delta$, and conſequently an Uniſon to its three parts equally divided in β, γ. Now if, $\alpha\delta$ being open, AD be ſtruck, its three parts, $\alpha\beta, \beta\gamma, \gamma\delta$ will ſeverally tremble, but not the points β, γ; which may be obſerved in like manner as the former. In like manner, if AE be a double Octave





to $\alpha\varepsilon$; the four quarters of *this* will tremble, when *that* is ſtruck, but not the points β, γ, δ. So if AG be a Fifth to $\alpha\eta$; and



conſequently each half of *that* ſtopped in D, an Uniſon to each third part of *this* ſtopped in $\gamma\varepsilon$; while *that* is ſtruck, each part of *this* will tremble ſeverally, but not the points γ, ε; and while *this* is ſtruck, each of *that* will tremble, but not the point D. The like will hold in leſſer concords; but the leſs remarkably as the number of diviſions increaſes.

This was firſt of all, (that I know of) diſcovered by Mr. *William Noble*, a Maſter of Arts of *Merton-College*; and by him ſhewed

ſhewed to ſome of our Muſicians about three years ſince; and after him by Mr. *Thomas Pigot*, a Batchelour of Arts, and Fellow of *Wadham-Colledge*, who, giving notice of it to ſome others, found, that (unknown to him) the ſame had been formerly taken notice of by Mr. *Noble*, and (upon notice from him) by others: and it is now commonly known to our Muſicians here. I add this further, (which I took notice of upon occaſion of making trial of the other,) that the ſame ſtring, as $\alpha\gamma$, being ſtruck in the midſt at β, (each part being uniſon to the other,) will give no clear Sound at all; but very confuſed. And not only ſo (which others alſo have obſerved, that a ſtring doth not ſound clear if ſtruck in the midſt;) but alſo, if $\alpha\delta$ be ſtruck at β or γ, where one part is an Octave to the other; and in like manner, if $\alpha\varepsilon$ be ſtruck at β or δ; the one part being a double Octave to the other. And ſo if $\alpha\zeta$ be ſtruck in γ or δ;

the one part being a Fifth to the other, and ſo in other like conſonant diviſions: But ſtill the leſs remarkable as the number of diviſions increaſeth. This and the former I judge to depend upon one and the ſame cauſe; *viz.* the contemporary vibrations of the ſeveral Uniſon parts, which make the one tremble at the motion of the other: But when ſtruck at the reſpective points of diviſions, the ſound is incongruous, by reaſon that the point is diſturbed which ſhould be at reſt.

Poſtſcript.

A Lute-ſtring or Viol-ſtring will thus anſwer, not only to a conſonant ſtring on the ſame or a neighbouring Lute *or Viol; but to a conſonant Note in Wind-Inſtruments: which was particularly tried on a Viol, anſwering to the conſonant Notes on a Chamber-Organ, very remarkably: But not ſo remarkably, to the Wireſtrings of an Harpſichord. Which, whether it were becauſe of the different texture in Metal-ſtrings from that of Gut-ſtrings; or (which I rather think) becauſe the Metal-ſtrings, though they give to the Air as ſmart a ſtroak, yet not ſo diffuſive as the other; I liſt not to diſpute. But Wind-Inſtruments give to the Air as communicative a concuſſion, if not more, than that of Gut-ſtrings. And we feel the Wainſcot-ſeats, on which we ſit or lean, to tremble conſtantly at certain Notes on the* Organ *or other*

Wind-Inſtruments; as well as at the ſame Notes on a Baſe-Viol. I have heard alſo (but cannot aver it) of a thin, fine Venice-glaſs, cracked with the ſtrong and laſting ſound of a Trompet or Cornet (near it) ſounding an Uniſon or a Conſonant note to that of the Tone or Ting of the Glaſs. And I do not judge the thing very unlikely, though I have not had the opportunity of making the Trial.

An Improvement of the Bononian *Stone, ſhining in the dark.*

THe Worthy Signor *Malpighi* in a late Letter of his to the Publiſher, of the 9*th* of *March*, takes notice, that one Signor *Zagonius* had a way of making out of the *Bononian* Stone calcined, Statues and Pictures variouſly ſhining in the dark. But he adds (to our ſorrow) that that perſon lately died, without diſcovering to any body his method of preparing the ſaid Stone.

An Extract of a Letter, written from Aberdeen *Febr.* 17. $167\frac{6}{7}$, *concerning a Man of a ſtrange Imitating nature, as alſo of ſeveral human* calculus's *of an unuſual bigneſs.*

SIR,

I Am very ſenſible of the great civility, wherewith you were pleaſed to entertain Maſter *Scougall* and me, when we waited on you laſt Summer; and ſhall be ready on all occaſions to give you that account you then deſired of things philoſophical that may occur here, to promote that noble deſign you have in hand. I remember, we had then occaſion to ſpeak of a Man in this Country very remarkable for ſomewhat peculiar in his temper, that inclines him to imitate unawares all the geſtures and motions of thoſe with whom he converſeth. We then had never ſeen him our ſelves. Since our return we were together at *Scrachbogie* where he dwells, and, notwithſtanding all we had heard of him before, were ſomewhat ſurprized with the oddneſs of this *Dotrel*-quality. This *Donald Monro* (for that is his name,) being a little old and very plain man, of a thin ſlender body, hath been ſubject to this infirmity, as he told us, from his very infancy. He is very loath to have it obſerved, and therefore caſts down his eyes when he walks in the ſtreets, and turns them aſide when he is in company. We had made ſeveral trials before he perceived our deſign; and afterward had much ado to

make

make him ſtay. We careſſed him as much as we could, and had then the opportunity to obſerve, that he imitated not only the ſcratching of the head, but alſo the wringing of the hands, wiping of the noſe, ſtretching forth of the arms, &c. And we needed not ſtrain complement to perſwade him to be cover'd; for he ſtill put off and on as he ſaw us do, and all this with ſo much exactneſs, and yet with ſuch a natural and unaffected air, that we could not ſo much as ſuſpect he did it on deſign. When we held both his hands, and cauſed another to make ſuch motions, he preſſed to get free: But, when we would have known more particularly, how he found himſelf affected, he could only give us this ſimple anſwer, *That it vexed his heart and his brain.*

I ſhall leave it to your conſideration, what peculiar *craſis* of ſpirits or diſtemper of imagination may cauſe theſe effects, and what analogy they bear to the involuntary motion of yawning after others, and laughing when men are tickled (which ſome will do if any body do make that titillating motion with their fingers, though it be at a diſtance from them; and whether, if his Nurſe have accuſtomed him to the frequent imitation of little motions and geſtures in his infancy, this may not have had ſome influence to mould the texture of his Brain and Spirits, and to diſpoſe him to this ridiculous apiſhneſs?

Beſides this, I took occaſion lately to viſit a poor Woman in the neighbouring Pariſh, who hath been of a long time ſadly afflicted with the Gravel, and hath paſſed four Stones of an unuſual bigneſs; of which I have one by me, which, though it be not the greateſt of the four, is yet more than five inches about the one way, and four, the other: which, if you pleaſe, ſhall be ſent you. They are all oval; the firſt, and a part of the ſecond were ſmooth; but the other two very rough; and the laſt, the biggeſt, which being come away about *Chriſtmas* laſt, was bloody on one ſide when I ſaw it. This puts me in mind of that Stone of a prodigious bigneſs, which was found laſt year in a Gentlemans bladder in this Country after his deceaſe, weighing two and thirty ounces. I am,

Sir,

Your humble Servant,

Geo. Garden.

Monſieur

Monsieur Leewenhoecks *Letter to the Publisher, wherein some account is given of the manner of his observing so great a number of little Animals in divers sorts of water, as was deliver'd in the next foregoing Tract: English'd out of* Dutch.

SIR,

I Received your Letters of the 12*th* and 22*th* of the last month; and I was not a little pleased, that my Observations about Water had not displeased your learned Philosophers. Nor do I wonder, they could not well apprehend, how I had been able to observe so vast a number of living Creatures in one drop of water, that being very hard to conceive without an ocular inspection. Mean time I never affirmed, that I could determine a certain number of those Animals living in water, but I generally said, that I imagined I saw so many: Not that I doubt of the truth of the thing, but use a certain number for an uncertain, and that not by exceeding the number, but by lessening it. I thus order my division of the Water and the enumeration of the *animalcula*: I suppose, that a drop of Water doth equal a Pea in bigness; and I take a little quantity of water, of a round figure, as big as a Millet-grain; this I reckon to be the one and ninetieth part of a pea: for when the *axis* of a Millet-seed maketh 1, that of a Pea will make $4\frac{1}{2}$: whence it follows, that the grain of a Millet is at least the 91*th* part of a Pea, according to the received Rules of Mathematicians. This small quantity of Water I gather up into a very slender glass-pipe, dividing by this means that little water into 25 or 30 parts, of which I observe one part after another, and shew the same to others.

Amongst other Spectators, I shew'd it to a not ordinary person, of great sagacity and an excellent sight, who judged with me, that in $\frac{1}{30}$ part of water, equalling the bigness of a Millet-seed, he saw more than a thousand living Animals: which when he highly wondred at, he wondred much more, when I said, I saw in it two or three kinds of much smaller Animals besides, which did not appear to him, because I saw them by another Microscope, which I still reserve to my self alone. Hence it is manifest, that, if in the $\frac{1}{30}$ part of one Millet-seed there are seen 1000, there may be seen 30000 in one such whole seed, and consequently in a drop of water, which is 91 times bigger than

than ſuch a ſeed, there may be ſeen 2730000.

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Otherwiſe I compare the quantity of the Water to the bigneſs of a grain of Sand; in which quantity of water I doubt not at all but that I ſee more than a 1000 little Animals. Now, if the *axis* of a grain of Sand be 1, the axis of a drop of water is at leaſt 10, and conſequently a drop is a 1000 times bigger than that ſand, and therefore 1000000 living Creatures in one drop of water. In which computation I rather leſſen than heighten the number. 'Tis true, my *calculus* is not, nor can be, ſo exact, as preciſely to determine the number: But I proceed, as thoſe do, who intending to number a flock of Sheep runniug confuſedly one among another, make an eſtimate by the breadth of the front, and the length of the ſides of a flock, how great the number of the Sheep may be. And as he, that ſeeth a thouſand Sheep running together, may in his conjecture erre from the truth a matter of an hundred, more or leſs; the ſame may eaſily be granted to me; yet I need not yield, that I ever do exaggerate my numbers; becauſe that the ſmalleſt little Animals, which daily occur to me in water, are more than 25 times leſs than a globul of blood, becauſe if the axis of ſuch a little Animal is one, that of a globul of blood is at leaſt three; now 3

3

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27.

Theſe, Sir, I thought good to add to the Obſervations, I have made, and ſhew'd to others, with the applauſe of the beholders. The reſt, and the make of the Microſcopes, employed by me, I cannot yet communicate. After I had ſent away my former Letter, I gave not over obſerving the *animalcula* in water; examining alſo diſtilled and boiled Waters.

Laſt

Laſt Winter, when the ſevere cold had killed the little Creatures, obſerving the water thawed by the warmth of the room, in which it had ſtood for a whole day with a fire in it, I found, after 24 hours were elapſed, and another time, after 17 hours were paſſed, that ſome living Animals appeared again in that water. When I ſhall write next, I intend, for further ſatisfaction, to aſſert and confirm the truth of what I have related by the teſtimony of divers Eye-witneſſes. I remain, *Sir*,

Delft, March 23. 1677. *Your, &c.*

The Continuation of the Hortulan and Rural Advertiſements, promiſed in the next foregoing Tract; communicated by the ſame hand, Dr. John Beale.

THe *Tract of* March, *having, as to theſe Hortulan Obſervations, ended with the fifth paragraph; we now proceed to the*

Sixth, which is to give notice, That the *Cider-Engins* for the more ſpeedy and commodious making of *Cider* and *Perry*, (as theſe Engins are now made by *Henry Allun*) may be ſeen at the Cabinet in *Exeter-ſtreet* near the *Savoy*; and in the *Palace*-yard, *Weſtminſter*. They may be compared with the Cider-Engin belonging to the Cider-houſes at *Queen-Hyth*, as alſo with thoſe belonging to the Cider-houſes beyond the *Tower*; and with the Engins invented by Mr. *Wolridge* of *Petersfield* in *Hampſhire*, and the formerly mentioned in *N.* 124, 583. An Ingenious Gentleman in this neighbourhood, the Owner of *Clifton*, a mile hence, having a Corn-mill and a Malt-mill, on a ſtream near his houſe, hath lately built a Cider-mill on the ſame ſtream, where it runs through his Orchard, and 'tis ſaid to grind Fruit perfectly well, and with incredible diſpatch. The upper ſtone is fitly hollow'd. The work done by an ingenious Joyner or Carpenter in a neighbouring Village. And I hear, that others are now deviſing to make Cider-mills, like Malt-mills to be drawn about with a Horſe or two, as their occaſion ſhall require. Mr. *Yarranton* in his *Improvement* and *Dialogue*, p. 106, *&c.* deſcribeth the Wind-mills and Water-mills, which he had ſeen amongſt Forreigners for the great benefit of the Cloathing-trade. I have long ſince ſeen three Mills, a Paper-mill, a Fullers-mill for the benefit of *Bewdley*, and a Mill to grind Scyths and other Utenſils of Husbandry, on the ſtream which feeds the three

three fair Fishponds at *Hurcourt*-lodge, near *Kiderminster* in *Worcestershire*. And I have marvailed, that in this Age of expert Engineers amongst us, we have not yet any Floating-mills to grind Corn upon some of our Rivers, as in *France*. I thought it a strange and pleasant sight, when the *Loire* about *Orleans* was all over cover'd with thick Ice, to see some hundreds, as we thought, of their floating Corn-mills drawn up into the *Loiret*, within sight of the Spring-head, from which the River flows immediately. We may have need of such help, where *Wears* *, which hinder the making of our Rivers navigable, shall be broken down. Some years ago I have seen Engins bought at *London* about 4 *l.* or 5 *l.* price, to grind Wheat or Bread-corn by the hand-labour of a man, sufficient for a full Family, without much charges. And so was all our Malt groun'd by domestick Malt-mills, in my memory. The Ancients did grind all their Corn, or pound it in Cities and in Armies, even in *Rome*, in the Age of her grandeur, by mens handy labour. And because many do discourage themselves from planting Cider-orchards, saying, that if they had the fruit, they should yet want many matters too costly for them: For their sakes, I shall here instance, that in all the neighbourhood round about us, they that make 20 hogsheads of Cider yearly, and much more, do pound all their fruit in Troughs, made for the purpose deep and strong, with broad-feeted pounders, one, two, or three (as their need requireth) pounding together in the same Trough. And to me they hold the paradox stoutly, That without more cost or trouble, this is the best and cheapest way. Workmen are cheaper in the Country at some season, than in some Cities. And 'tis a charity to employ Men that want employment, rather than Beasts; and sometimes 'tis unsafe to trust, either to the Winds or to the Water. The Needle-makers will not take it well, that Needles should be made as easily, and cheap as Pins: Nor Glass-houses, that Glass should be made malleable.

*Wears are Artificial Rocks, or Stone-walls, formerly made in great Rivers, to lead or raise a part of the stream for Corn-mills; which Wears must all be demolish't, before the River can be made navigable.

Sir, you said very well, that Cider-Orchards and Household-Gardens are convenient Adjuncts for Trades-mens granaries, *N.* 131. *p.* 796. But perhaps the truth of that expression extends further

further than you are aware of. I ſhall explain it by Inſtances, which are here apparent before our eyes, and do ſeem to me worthy to be conſidered in moſt other parts of *England*. Cider (you know) coſts no fuel to brew it, and the labour is but once in the year. 'Tis drawn by divine Chymiſtry; ſo many Trees, ſo many huge Alimbecks, which attend to that divine work conſtantly all the year; they need no Furnaces, to ſend forth a corroding ſmoak to choak all the City, to ſtrangle them into Conſumptions, and to corrupt all beauties and amenities. Neither Iron, Steel or Marble can reſiſt the fumes of Brewing-houſes; whereas Cider is of a thouſand kinds ('tis as hard to number all ſorts of Apples and Pears, as to number all ſorts of Grapes and Figs,) proper to cure many diſeaſes; and a kind vehicle for any healing Vegetable, or other Medical matters. To ſpeak modeſtly and without an hyperbole; the Cider of the beſt Pepins duly ripened and kindly fermented, is a peculiar remedy for the Conſumption; and generally all ſtrong and pleaſant Cider (as we have here) exciteth and cleanſeth the ſtomach (which, if foul, is eſteem'd by famous Phyſicians the Mother of all diſeaſes:) It ſtrengthneth digeſtion and infallibly frees the Kidneys and Bladder from breeding the Gravel and Stone. This is (above all) the peculiar excellency of the right Red-ſtrake of *Irchin-field*, when it eſcapes all ſophiſtications. But that which makes Cider fitteſt to accompany the Trades-mens granary, is, that if it be made of right Cider-fruits, ſo that it be full bodied, and ſtrong, it will hold good without decay, and will yearly be much improved for ſome years, to the next plentiful year; as uſually it falls out, and beſt of all in large Veſſels; the larger, the better. Tradesmen ſhould not be for bottled-Cider, which is commonly more windy, than healthful. It hath been tried from my Childhood in Veſſels of 14, 15, or 16 hogſheads, of the free houſhold meaſure, containing between 60 or 70 Statute-gallons. I have been often told, that Sir *John Winter* had a Veſſel, which contained 30, or at leaſt 28 hogſheads. So that now for a fit match to a Granary (as Cider increaſeth here) we have need to think of the great Veſſel at *Heydelberg*, deſcribed in your *Numb.* 130. *p.* 768. If it be the ſame Veſſel, which was made by *Michael Vernains*, and holds good ſtill, it muſt be of long durance. For, this Cooper was famous (as I have

it

it from good Authors) for making such a huge Vessel for Prince *Frederick* Elect. Palatine of *Heydelberg*, An. 1591. And a far greater, *An.* 1593, 1598. for Prince *Henry Julius*, Duke of *Brunswick*. Sir *John Winters* Vessel is said to be hooped with Plates of Iron; these with Timber. To conclude this point soberly; When the Citizens shall ordinarily drink Cider well-diluted, as the *French* drink Wine, and as the sober people in all our Cider-countreys drink their washings of Cider (as they call it) and Cider well diluted in the grinding time, and as they drink in *London* their Six shilling Beer, I am perswaded, it will much conduce to the health, which is the life of the people; For, *Non est vivere, sed valere, vita.* And I have often heard Labouring people affirm, that they are more strengthened for hard work by Cider largely diluted, than by very good Beer.

Yet I have much more to say for Houshold-Gardens, as a fit Match for Granaries. *Cato*, the Oracle of *Rome*, undertakes by copious Instances in his positive style, that *Coleworts* are a cure for all Sores and Diseases. His Universal medicine, *Coleworts* and *Cabbages*, with a little care, hold out seven or eight months. *We* have them all the year round; good sauce for Bacon as red as any Rose, as they have it in *Herefordshire*, where the Swine will get a share of the fruit, which fall from their hedges: And the Bacon of *New Forrest* is generally commended. These are in good houses always at hand; and may be easily dressed without waste of much time. But Roots of all sorts, Rapes, Turneps, Carrots, Parsneps, Skirrets, Potado's, do challenge the precedence before Granaries: They are a kind of *under-ground Granaries*, and do ofttimes hold out, when Corn faileth; specially the Potado's of *Barbados*, or of *Virginia*. The Potado's of *Barbados* (in our fresh memory) relieved *Ireland* from two years Famine, when their Corn failed there: As *Chesnuts* relieved *France* in the extremity of their Civil war, when their Ploughs were forsaken. These Potado's cost little or no culture, for ten years together, being only covered with Fern, or other light muck, and that turn'd in with the Earth; and two or three Roots, as often as there is occasion to take any of them up for use. And they should be taken up, here and there, (by small parcels) where

they grow thickeſt. A few Acres of theſe will run far to furniſh a City, and the Country round about.

Before and ſince you gave notice of them from me to the *R. Society*, they have been ſold in the Markets of *Briſtol* and *Wells*, at the price of four ſhillings *per* buſhel; dear enough in reſpect of the eaſie propagation and eaſiy culture, and cheap enough in reſpect of their uſe. Children of poor people thereabout, eat them raw (inſtead of Bread and other food) without hurt. Some do roaſt them in Embers, as they do Wardens; ſome do boyl them, peel them, and eat them with Butter and Pepper, either ſerved whole, or chopt, as they do Parſneps. Some do ſtrengthen their Beer or Ale, or make good Drink with them. So they are, to them, inſtead of Corn and Malt, and an acceptable Treat. Every way they are a ſtrong and wholeſom nouriſhment for Labourers. Some do parboyl them ſlightly, peel them, and mince or cut them in ſmall bits, mingle them with ſlices of Fat fleſh, ſeaſoning all to their palate, and bake them in Pyes or Paſtyes; and they eſteem them a reſtorative delicacy, not much inferiour to Artichocks. Artichocks were once a dainty for Emperours, ſaith *Muffet*; and were (in his remembrance) ſold for a Crown apiece in *England*. Now they are cheap, and vulgar in *France* for more than half the year; and are eaten raw there with Pepper and Salt when no bigger than a Cloak-button, or fried in ſweet Oil or Butter, or dreſſed to their mind, when they come to full maturity. Sir *Hugh Platt* hath taught us, how to keep ripe Artichocks green and freſh for all Chriſtmas, in his *Jewelhouſe*, chap. 1. and for Eaſter, in his *Cloſet*, 2. 69. So we may have them young, or ripe for the whole year round.

To return to *Potado's*; I obſerve them to grow and proſper abundantly in much differing kinds of Soil, from the North of *Shropſhire* to the Sea coaſt of *Dorſetſhire*. But they like not a ſtiff and ſtrong land. I tried them two years in a ſtrong Wheat-land, and could get no good of them there. All the Roots, which were there generated, were little bigger than the bulbs of *Saffron*. In light and hollow-land of the hotteſt ferment (which is commonly of little worth for Corn or Paſture,) there Potado's thrive beſt and taſte beſt. But now I am at a difficulty, whether the great difference, which we find

find in the reliſh, be from the differing kinds of the Potado's of *Barbados* and *Virginia*; or, whether thoſe differ in kind (for both have the ſame reſemblance above-ground,) or whether the difference, which we find, be only from the diverſity of the Soyl.

That the Soyl makes a great difference, and that all may be careful to chuſe a fit Soyl for their Garden-diet, I ſhall here offer ſome notable Inſtances to prove it. All the people here, (the very vulgar,) do find the Carrots, and Turneps or Rapes, from the common Fields of *Meriot*, eight miles from hence, Weſtward, far to excel other very good Turneps and Carrots in fatneſs and pleaſing reliſh. And Cabbage-plants from the wide Fields of *Lydiard*, weſtward of *Taunton* (where they have a rich reddiſh Soyl) do ſo far excel all other the beſt Cabbage-plants, that theſe *Lydiard* plants are bought in all places at 80 miles diſtance. In the Spring-time, when the ways are pretty deep, I ſee many Horſes paſs through this Town laden with *Lydiard*-plants, which they ſell here, and in all Town many miles beyond *Salisbury*. All call for *Lydiard*-plants, and give more for them than for many other. They become ſooner, and ſurer, and ſweeter Cabbages. And Garden-plants are ſometimes much altered in taſte and properties, by the accidents of the year. In a droughty Summer, the Plague then being hot in *London*, we had Carrots in *Northamptonſhire* from a kind Soyl, were they were wont to be very good; but then ſo rank, dry, and earthy, that we could not endure toſee them on the Table.

I hear that the Turneps of *Hackney* are better than other Turneps about *London*. We have here very good Turneps, white and yellow, which are fatter and eſteemed more reſtorative. But all *England* wants the *Bohemian* Turneps, blood-red on the outſide; which are extold by *Muffet* (as he found them in *Prague*) to be ſo reſtorative and delicate, that the Emperour himſelf nurſeth them in his Garden. Theſe Arguments I produce to invite them that have the kindeſt Soyl for theſe *underground Granaries*, Potado's and Turneps, to get them immediately from *Barbados*, *Jamaica* and *Prague*, by Merchants, at the firſt hand, before they be degraded, or any ways vitiated by more unkind Soyl. And ſince there is a peculiar ſort of

Black

Black Mulberries, which do far excel the reſt for our Junkets, as all our old Books tell us all along down, till within theſe 1200 years, we muſt ſend for them to *Naples* or *Sicily*, or to *Perſia*, whence our Silk-trade came. The White Mulberries (as we call them) are for the fineſt Silk.

The *Spaniſh* Potado requires diligent culture, much Sun, and a light and pregnant Garden-ſoyl. In the modern Latin they are called *Glandes Malacenſes*, being brought into *Spain* from *Volez Malaga*, a Province in *America*. They report that more than a dozen of their huge *Spaniſh* Ships were brought at one time to *Sevil* in *Spain*, fully fraghted with theſe Potado's, and were ſoon diſperſed all over *Spain*. *We* ſay, the *Spaniard* is ſlow at every thing: But *they* may ſay, The *Engliſhman* in many parts of *England*, is more ſlow at the beſt Improvements of our own Country; witneſs our want of *Vineyards*, of *Groves*, of *Mulberries*, of the beſt *Cheſtnuts*, *Wall-nuts*, *Figs*, *Almonds*, which are wanting in moſt parts, and do not refuſe to grow in our Climate. Mr. *Hughes*, in his *American Phyſician*, ſaith, The Potado's of *Jamaica*, and of the Leeward Iſlands, *Barbados*, *&c.* do much exceed *Spaniſh* Potado's, and are the beſt, the moſt wholeſom and delicious Root in the whole World; that ſome of the Roots are yellowiſh, or of a golden colour, ſome white. We wiſh again, that we had them of all ſorts at the firſt hand, to be tried in light and quick Land, a litle ſhelving towards the South. *Muſhroms* and the *Tuberes* or *Tubera* from *Libya*, were the choiceſt delicacies of *Rome* for many Ages.

But I am not at leiſure to ſerve Luxury; yet 'tis better, we ſhould have the beſt at home, than be always at the charges to ſend for them. And 'tis probable that our own Native ſoyl will make them wholſom for *Engliſhmen*.

A Letter of Monſieur Hevelius, *giving an account of his Obſervations, made for ſeveral years together concerning three New Stars, one in the* Whale's *Neck, the other two near the Head and in the Breaſt of the* Swan.

Illuſtri Viro

Dom. *Henrico Oldenburgio,*

Illuſtriſſimæ Regiæ Societ. Secretario,

Joh. Hevelius, S.

CUm nova illa mira Stella in collo Ceti *nuperrimè ex inſperato rurſùs ex æthere prodierit, etiamſi ad meas ultimas* 15 Sept. *datas nullum adhuc reſponſum à Te obtinuerim, volui tamen vos quantocyus certiores reddere, quid de ea hîc* Gedani *mihi obſervare obtigerit. Nam cùm ſciam, haud paucos in Illuſtriſſima Regia noſtra Societate inveniri, qui rebus æthereis impenſè delectantur, putavi me illis rem non uſque adeò ingratam facturum, ſi inprimis hâc occaſione ſimul ordine commemorem, non ſolùm quid nuperis diebus, ratione hujus Stellæ, ſed etiam quid pariter à* 10 *vel* 12 *ferè annis, incipiendo ab Anno* 1665, *tam in hac Stella in* collo Ceti, *quàm duabus reliquis novis, ſub* Capite *nimirùm & in* Pectore Cygni *exiſtentibus, à me fuerit deprehenſum.*

Compertum quidem eſt omnibus, novam hanc Stellam in Collo Ceti *ab Anno* 1638, *ad Annum uſque* 1662, *continuò, & quidem eodem ſemper Cæli loco, obſervatam eſſe; ſed non ſemper eâdem magnitudine, & claritate fulſiſſe; tum ſingulis annis diſparuiſſe, ac rurſùs emicuiſſe, nunc citiùs, nunc tardiùs, nullo tamen certo tempore ſervato: prout ex Hiſtoriolâ noſtrâ hujus admirandæ Stellæ, Anno* 1662. *ſimul cum* Mercurio *meo in* Sole *viſo editâ, abundè* pag. 164. *patet. At verò quid de hâc ipſa Stellâ, ſubſequentibus Annis, præſertim ab Anno* 1665, *hucuſque acciderit, puto non omnibus æque bene eſſe exploratum. Atque ideo pro continuanda illa Hiſtoriola,* Mercurio *meo annexâ, volui in appoſita Tabella, apparitiones illius, & quæcunque de ea notata fuêre, ordine exhibere: quò uno intuitu cuique liceat ejus ortum & occaſum, quomodo creverit, & decreverit, quando prorſùs delituerit, ac rurſùs refulſerit, cognoſcere. Videbis præprimis dictam novam Stellam in* Collo

Ceti

Cetì *usque ad Anni* 1672 *Mensem* Octobris, *singulis annis sese conspiciendam dedisse, quanquam diversissimâ facie, ut modò dicebam; postea verò per integrum quadriennium, ab Anno scilicet* 1672 *Mense circiter* Octobri, *ad* 23 Decembr. *Anni elapsi* 1676, *ne semel quidem prodiisse, ut ut semper omni studio vigiles oculos ad eam, quoties Observationibus operam serenis noctibus dedi, direxerim.*

Idcircò, quò minùs unquam à Veteribus observatum fuit, sidera fixa admirandas adeò passa esse vicissitudines, & quidem continuò tot annorum spatio; rursùs per aliquot annos planè delituisse, ut ne quidem ullo Telescopio fuerint deprehensibiles; merentur profectò eò magis notari; ut Posteros simul excitemus, ne minùs ejusmodi phænomenis sedulò invigilent, ad magna hæc Jehovæ opera plus pluſque perscrutanda. Stellæ quidem diversæ novæ à Prædecessoribus sunt observatæ; sed, quantum memoriæ proditum est, hujus generis nullæ, si duas illas excipias, hoc nostro quoque ævo conspicuas: utpote illam in Pectore Cygni, *à* Keplero *primum An.* 1601, *si rectè memini, detectam; alteram sub* Capite Cygni *An.* 1672 *exortam. De his quid pariter nuperis annis à me observatum hic fuerit, ex* Ephemeride *annexâ abundè patet: Stellam nimirùm illam in* Pectore Cygni, *quæ ab Anno circiter* 1662 *planè disparuerat, rursùs Anno* 1665, *Cœlo sereno revivisce re visam esse; sic ut Anno subsequente* 1666, *rursùs instar Stellæ minutissimæ observari etiam Sextantibus potuerit; ab eo verò tempore, paululùm quidem crevisse, sed hucusque nondum ad priorem magnitudinem (tertii videlicet honoris) atque claritatem & splendorem (quâ magnitudine Anno* 1657, 1658, *&* 1659 *apparuit) pervenisse: Siquidem hæc dum scribo nonnisi instar Sextæ magnitudinis adhuc fulget. At verò illa sub* Capite Cygni, *quæ Anno* 1670 *æstate primùm nobis in conspectum, instar Stellæ tert. magn. venerat, Mense* Octob. *&* Novemb., *postquam sensim magnitudine & lumine prius decreverat, planè evanuit; rediit tamen rursus subsequente Anno* 1671, *Mense* Aprili, *& totâ Æstate, quanquam diversa facie, fuit conspicua, ad Annum usque* 1672, *Mens.* Mart. *à quo tempore neutiquam amplius in conspectum venit, ut ut sæpius illam diligenter quæsiverim. Ex quibus Astrophili haud obscurè intelligent omnes, quid hucusque in his tribus novis Stellis à* 12 *elapsis annis deprehensum fuerit; quid verò in posterum accidet, sequentium annorum Observationes docebunt.* Vale, & salutâ meo nomine quàm officiosissime Ill. Reg. Nostram Societatem, cui

ex

ex animo omnia fausta ac felicia comprecor. Dabam *Gedani* Anno 1677. die 2 *Januarii*, St.n.

Annus, Mens. dies,		Ephemeris Novarum Stellarum.
1665	Novemb. 28	*Stella illa nova in Pectore Cygni, quæ aliquandiu ab Anno 1662 planè delituit, Cœlo sereno quasi revivisceré videbatur.*
1666	Sept. 21	*Nova Stella in collo Ceti nusquam affulsit; at verò altera in pectore Cygni nudis oculis etiam Luna splendente apparuit.*
1666	Sept. 24	*Nova ante pectus Cygni, minor erat illis tribus præcedentibus in Collo, quas in Globum transtuli; vix 6 magn. videbatur: observata est hâc die à Marcab. & Scheat Pegasi.*
1667	Januar. 7	*Nova in Collo Ceti nondum apparuit.*
	13	*Nova in Collo Ceti necdum fulsit.*
	Febr. 2	*Nova in Collo Ceti primâ vice emicuit; æqualis erat magnitudine illi in ore, vel ei in Nodo Lini.*
1667	Febr. 7	*Nova in collo Ceti erat adhuc æqualis illi in ore Ceti.*
	10	*Nova in collo Ceti clarissimis radiis deprehensa.*
	27	*Nova in collo Ceti clarè admodum fulsit; etsi Luna notabili lumine jam esset imbuta: major erat illâ in ore Ceti.*
	Martii 13	*Dilucide pariter ea ipsa in collo Ceti apparuit, eadem fere magnitudine.*
1668	Octob. 26	*Nova in collo Ceti hâc die primùm visa; sed instar minutissimæ Stellulæ.*
	Novemb. 7	*Nova in collo Ceti mediam ferè in ore æquabat.*
	16	*Nova in collo Ceti æqualis ferè illi in ore Ceti.*
1669	Januar. 28	*Nova in collo Ceti minor erat illâ in ore.*
	Sept. 26	*Nova in collo Ceti instar 6 magn. apparuit.*
	Octob. 16	*Nova in collo Ceti illâ in ore major erat, & clarior.*
	24	*Nova in collo Ceti Lucidam Mandib. æquabat.*
	Novemb. 19	*Nova in collo Ceti major illâ in ore, & minor Mandib.*
1670	August. 27	*Nov. in collo Ceti maximo gaudebat lumine, æqualis ferè Stellis secundæ magnit. & Mandib. Ceti.*

Annus,	Mens. dies,	Ephemeris Novarum Stellarum.
1670	Sept. 3	*Nova in collo admodùm fulgida extitit; altera verò in pectore Cygni crescere videbatur.*
	8	*Nova in collo Ceti æqualis adhuc Mandib. Ceti; Altera sub capite Cygni evidenter decrescere videbatur; sic ut vix major illâ duarum informium, caput Cygni præcedentium, superiori mihi visa sit,* h. e. 5 *magnit.; illam verò in pectore Cygni paulò adhuc crescere deprehendimus.*
1670	Octob. 13	*Nova sub capite Cygni vix ac ne vix videbatur, ut ut caput Cygni, tum nova Pectoris satis clarè apparuerit.*
	14	*Nova sub cap. Cygni adeò exilis ac debilis extitit, ut nullâ ratione, licèt cœlum perquàm esset serenum, Sextante observari potuerit; vix enim ac ne vix nudo oculo deprehendebatur.*
	Decemb. 5	*Nova in collo Ceti adeò decreverat ut vix Stellæ sextæ magn. æquaretur.*
1671	April. 29	*Novæ sub cap. Cygni, denuò 3 magn. visæ, major aliquanto rostro Cygni; imò ferè illâ in ancone inferioris alæ; sed paulò minor illâ in pectore, tum obtusioris luminis, quàm rostrum & pectus. Altera verò illa in pectore vix major adhuc apparuit, quàm anno præterito; siquidem Stellis 6 magn. æquabatur.*
1671	Maii 17	*Nova sub capite Cygni aliquanto minor videbatur rostro Cygni, & illâ in humero Aquilæ, tum etiam lumine obtusior; major tamen illâ in cuspide Sagittæ, & æqualis ferè illi seq. in Jugo Lyræ.*
1671	Maii 25	*Nova sub cap. Cygni minor videbatur, quàm die* 22 April. *quâ primùm visa fuit; sic ut decrescere videretur. Minor jam erat rostro Cygni, nec non illâ in ancone Alæ Austr., etiam minor illis in Jugo Lyræ, & humero Aquilæ; vix major apparuit minori duarum in pede Cygni, & illâ in pectore Aquilæ.*
1671	Junii 26	*Nova sub cap. Cygni minor apparuit illâ in collo Cygni; sic ut notabiliter decreverit; alterâ verò ante pectus Cygni major ferè videb. quàm anno præterito.*
	Julii 3	*Nova sub cap. Cygni ferè minor illâ in collo Cygni.*

1671	Julii 18	*Nova sub cap. Cygni vix Stellis 5 magn. æquiparari videbatur.*
	Aug. 2	*Nova eadem vix 6 mag. apparuit, imò minor quàm reliquæ omnes circa caput & collum Cygni existentes, per intervalla tantummodò micabat.*
1671	Aug. 6	*Dicta nova adeò decreverat, ut vix in oculos incurreret, cœlo licet admodùm sereno.*
	7	*Nova sub cap. Cygni vix in oculos incurrebat, ut ut omnes oculorum nervos in eam intenderim.*
	12	*Hæc ipsa vix deprehendebatur.*
1671	Aug. 14	*Novam sub capite Cygni vix animadvertere potuimus; Altera verò in collo Ceti æquabatur Stellæ ad Genam, imò ferè major paulò videbatur.*
	15	*Nova sub capite Cygni vix amplius conspecta.*
	16	*Nova sub cap. Cygni vix amplius visa.*
	17	*Nova sub cap. Cygni vix ac ne vix deprehensa.*
	25	*Nova sub cap. Cygni non amplius fuit conspicua.*
	Sept. 11	*Nova sub cap. Cygni haud amplius conspecta.*
1671	Sept. 12	*Nova in collo Ceti æquabatur illi in ore, 4 sc. magnit.*
	Oct. 30	*Nova in collo Ceti vix 6 magn. apparuit.*
	Nov. 3	*Nova in collo Ceti non amplius apparuit.*
1672	Mart. 29	*Nova sub cap. Cygni vix 6 magn. apparuit. Altera verò in pectore quasi adhuc crescere videbatur.*
	Aug. 9	*Nova in collo Ceti, clarissimis fulgebat radiis, major erat illâ in ore, & minor Mandibulâ; at verò sub cap. Cygni nusquam hoc anno affulsit.*
	Sept. 17	*Nova in collo Ceti minor illâ ad Genam, vix quartæ, imò quintæ magnit.*
	25	*Nova in collo Ceti vix sextæ magnitudinis.*
1673	Sept. 14	*Nova in collo Ceti haud adfuit.*
	Octob. 9	*Nova in collo Ceti nusquam apparuit.*
	18	*Nova in collo Ceti necdum orta est.*
1674	Aug. 10	*Nova in collo Ceti nec adhuc fulsit.*
	13	*Nova in collo Ceti nondum apparebat.*
	Oct. 20	*Nova in collo Ceti nondum conspecta.*
	Dec. 17	*Nova in collo Ceti nondum apparuit.*
	20	*Nova in collo Ceti necdum prodierat.*
	25	*Nova in collo Ceti nondum affulsit.*

1675	Febr. 15	*Nova in collo Ceti hucusque nondum prodiit.*
	Julii 22	*Nova pectoris Cygni, à quo rursùs reluxit, constanter singulis noctibus apparuit, sed instar 6 magn.*
	Aug. 19	*Nova in collo Ceti nondum apparuit.*
	27	——— *necdum affulsit.*
	Sept. 20	——— *haud apparuit.*
1675	Oct. 13	*Nova in collo Ceti nondum deprehensa, nec Tubo optico illam animadvertere potui, ut ut illa minutissima novam præcedens distinctè observari potuerit.*
	15	*Nova in collo Ceti haud conspecta.*
	Nov. 21	——— *usquam apparuit.*
	22	——— *neutiquam adhuc conspecta.*
	Dec. 10	*Nova in collo Ceti haud animadversa.*
1676	Jan. 13	*Nova in collo Ceti nondum adfuit.*
	15	*Nova in collo Ceti nondum apparuit.*
	Nov. 25	*Nova in collo Ceti neutiquam adhuc deprehensa, ut ut eo tempore plurimas Fixas à Mandib. Ceti observaverim.*
1676	Dec. 10	*Bene memini me novam hanc in collo Ceti pariter haud vidisse, licet eâ in cœli parte plurimas Stellulas observaverim; si adfuisset, utique illam vidissem. Posthac plurimi dies nubiloſi extiterunt, ut veſperi Stellas observare haud potuerim ad diem usque* Dec. 23.
	Dec. 23	*Quâ novam hanc in collo Ceti cœlo admodum sereno clarissimè vidimus; & quidem tantâ claritate & magnitudine fulgentem, ut Mandibulam Ceti non solùm æquaret, sed magnitudine & claritate vinceret. Volebam eam quoque eo tempore ab aliis Stellis dirimere, ut viderem, an adhuc firmiter suo loco persisteret; sed totum cœlum subitò adeò nubibus fuit obductum, ut hâc vice id fieri haud potuerit.*
	Dec. 31	*Nova in collo Ceti ferè major Mandib. h. e. 2 magn.*
1677	Jan. 1.	*Nova in collo Ceti clarissime rursùs affulgebat, major ferè Mandib. Ceti, major quoque quàm Extrema alæ & Marcab Pegasi, colore & lumine ferè æqualis Mandib. Memini tamen me olim observaſſe, quando secundæ existebat magnitud. eam paulo albicantiorem & splendidiorem. Quid porrò cum hac ipsa Stella accidet, observationes docebunt.*

An Account of two Books:

I. *Traité de la PERCUSSION ou CHOQ Des CORPS, &c. par Monſieur* Mariotte, *de l'Academie Royale des Sciences. A* Paris, 1673. *in* 12°.

THis Mathematical Author begins this Book with ſome *Definitions*, neceſſary for the underſtanding of ſome terms frequently uſed by him. *One* is that of a *Springy Body*, by which he underſtands ſuch an one, as having changed its figure by the percuſſion of another body, retakes of it ſelf its former figure. An *other* is that of a *Body not Springy*, which, to him, is ſuch an one, as having taken a new figure by the preſſure of another body, conſerves that figure, as Wax, &c. The *laſt* Definition is that of the *reſpective Velocity* of two bodies, by which he means that, whereby they approach to, or are removed from, one another, whatever be their own velocities.

Next he lays down certain *Suppoſitions* averred by divers intelligent Geometricians, and grounded upon ſundry conſiderable Experiments. Theſe Suppoſitions are, 1. That a Body being put in motion, will always continue that motion the ſame way with the ſame velocity, if it be not hindred or diverted by the encounter of another body, or ſome other cauſe. 2. That the Bodies that are impelled upwards by different forces, are raiſed to different heights, and that theſe heights have the ſame proportion to one another, as the ſquares of the velocities, wherewith theſe bodies began to be raiſed: And reciprocally, that the bodies which fall by their own weight from different Altitudes upon one and the ſame Horizontal ſurface, do encounter that ſurface with different celerities, of which the Squares are to one another as their Altitudes. 3. That, if a body, (as B *) ſuſpended at a ſtring AB, is perpendicularly impelled upward, and raiſed to a certain height, as BD; that body when it is ſtruck horizontally, ſo as to begin its motion with the ſame velocity, will be raiſed to the ſame height in C, by

* *See the Fig. in the Author.*

by the arch BC, the line CD being ſuppoſed horizontal: And if it falls back, whether it be by the perpendicular DB, or by the arch CB, it will re-take in the point B a velocity equal to that, which had raiſed it to the point in C or in D. Which two Suppoſitions are well eſtabliſhed by *Galileé* and divers other Geometricians, abſtractedly from the Reſiſtance of the Air and of other Impediments; and they are alſo, (ſaith our Author) very near conform to Experiment, the reſiſtance of the Air notwithſtanding. But he takes them in this Treatiſe in an exact preciſeneſs, to make the Demonſtrations the more intelligible. 4. That the ſmall vibrations of a *Pendulum* are made in times *ſenſibly* equal, although they deſcribe unequal arches: But for the facility of the Demonſtrations, 'tis here ſuppoſed, that theſe times are *preciſely* equal.

From the Experiments which he hath made with the motion of Balls that have no Spring, this general Conſequence is drawn, That if a body not-ſpringy ſhould impel another body not-ſpringy and unſhakeable, it would remain without motion, and not turn back, there being no new cauſe at all for a motion that way. And thus he remarketh, that 'tis much eaſier to ſtop a ball that is rolling, and to make it loſe its motion, than to drive it back with the ſame celerity; becauſe, that beſides the force which is requiſite to ſtop it, there needs another to give to it again its former velocity.

So that 'tis certain to our Author, (as it is to divers others) that all motions of Reflexion are made by a Spring. And, though at firſt it ſeems difficult to believe, that bodies of the hardneſs of Ivory and Steel (for example) which do reflect bodies as hard as themſelves, are flexible, and capable of having ſuch an impreſſion made on them as is required for a Spring; yet our Author eaſily reſolves this ſcruple, by referring his Reader to thoſe ſmall impreſſions and dints, remaining in Iron after it hath been ſtruck by a hard body, though Iron be harder than Ivory, and almoſt as hard as Steel. To which he adds, that 'twere impoſſible, that a Glaſs-ball or a Ball of baked Earth ſhould break, if it did not change its figure when it is with great force thrown againſt another hard body. And in regard we ſee, that theſe Balls keep their roundneſs when having been ſtruck they break not, they muſt needs (ſaith he) exactly retake their former figure

figure by vertue of their ſpringineſs, after they have been a little impreſſed upon.

Beſides, he takes notice, on this occaſion, of an Experiment, which ſeems ſtrongly to ſupport his ſentiment, which is, That if you let fall upon a great flat and poliſh't Stone a Ball of Clay pretty ſoft, from the height of 12 or 15 inches, putting a little paper or linnen rag on the place where the ſaid ball is to touch the ſtone, that ſo it may not ſtick to it, it will not remount at all, or very little: But if you let fall upon the ſame ſtone a Ball full of compreſſed Air, you will ſee that part, by which it touches the ſtone, flatten'd like the ball of ſoft earth; but this impreſſion fully reſtoring it ſelf, the ball will remount very high, and it would fly up higher, if the Air, which reſiſts much more to a very large and very light body, than to a ſmall and very ponderous one, did not ſtop a conſiderable part of its velocity, as well in deſcending as aſcending.

Whence, and from other Reaſons and Experiments, by him delivered, he concludes, that the greateſt part of hard bodies, as *Steel*, *Marble*, *Glaſs*, *Ivory*, *Jaſper*, &c. have a ready and ſtrong ſpringy power; and that all the motions of reflecting bodies are only made by ſprings. Whereunto he adds, that if it ſhould be ſuppoſed that hard bodies are inflexible, it would be impoſſible to explicate their motions when their weights are unequal, and that the phænomena do no ways agree to ſuch an hypotheſis. But taking it for a meer Hypotheſis, what he pretends to have demonſtrated concerning the Springineſs of Hard bodies, he tells us, that by that means all motions, befalling thoſe bodies, after they have any way impelled one another, may eaſily be accounted for. And he is perſwaded, that this truth may eaſily be ſeen by a great number of Propoſitions, which he advanceth in this Book, of which the Demonſtrations agree very well with the Experiments.

II. Johannis Trithemii *STEGANOGRAPHIA, vindicata, reserata, & illustrata*, &c. *Auth.* Wolfgango Ernesto Heidel, *Wormatiensi.* Moguntiæ, 1676. *in* 4o.

THis *Steganography*, (which word imports the Art of signifying ones mind to another by an occult or secret way of writing) having been censured as supposititious by some, and pernicious, magical and necromantical by others; this learned Author undertaketh to vindicate it from those aspersions, and withal to give us the true Key and meaning thereof.

After which vindication and discloſure he explains all the reputed Conjurations of Spirits, made up of the *Arabic, Hebrew, Chaldaic* and *Greek*, or, according to others, out of Barbarian and insignificant words: Subjoyning to all this, some new Steganographique Artifices, which had been promised by *Trithemius* to *Arnoldus Bostius*, and had been counted paradoxical and inexplicable.

Errata in *Numb.* 133.

Pag. 818. lin. 6. l. *Seed* for *Spade*.

Imprimatur,

May 3*d.* 1677. *BROUNCKER*, P. R. S.

London, *Printed for* John Martyn, *Printer to the R. Society*, 1677.

PHILOSOPHICAL TRANSACTIONS.

May 26. 1677.

The CONTENTS.

Extract of three Letters of Dr. Wallis, *concerning an unusual* Meteor *seen at the same time in many distant places of* England. *Communications touching four sorts of factitious Shining substances. Divers Letters about the late* Comet, *from Signor* Cassini, *Monsieur* Hevelius, *and Mr.* Flamstead. *An Account of Four Books:* I. *The Natural History of OXFORD-SHIRE, &c. By* Robert Plott, *LL. D.* II. *L'ARCHITECTURE NAVALE, avec le ROUTIER des Indes Orientales & Occidentales; par le Sieur* Dassié. III. *Philosophical Dialogues concerning the Principles of Natural Bodies; by* W. Simpson, *M. D.* IV. *A New Treatise of CHYMISTRY; written in French by* Christopher Glaser, *and now Englished by* F. R. S. *An Advertisement of a New Mapp of* England.

An Extract of Two Letters, written by Dr. Wallis *to the Publisher the* 20th *and* 30th *of* January *last, concerning a considerable* Meteor *seen in many distant places of* England *at the same time* †.

† *This was not published sooner, because more particulars were expected both from other places of* England, *and from Forreign parts.*

SIR,

I Do not know, whether in your Transactions you have any where taken notice of that unusual *Meteor* which happened on Wednesday *Sept.* 20*th.* last past, about Seven of the clock at night or soon after; which, though it seemed very low, was

ſeen in moſt parts of *England* much at the ſame time, and much in the ſame manner. I hear of it from divers perſons who ſaw it in *Oxford*, *Northamptonſhire*, *Glouceſterſhire*, *Worceſterſhire*, *Somerſetſhire*, *Hampſhire*, *Kent*, *Eſſex*, *London*, *&c.* and I doubt not but you have heard of divers more. Some here call it a *Draco volans*. I have ſometimes been fancying, it might be higher than they imagined, only caſting a light ſo low. And if I had heard any thing from it abroad, ſhould have inclined to think it a *Comet*, paſſing ſwiftly by us, very near the Earth, even through our Air. But, if it had been ſo, it muſt be a very little one, or elſe we ſhould have heard more of it.

A Third Letter from the ſame hand, concerning the ſame Meteor.

Oxford, *May* 8. 1677.

SIR,

I Remember that in *January* laſt I wrote you two Letters, concerning an unuſual appearance which had here happened not long before, on Wedneſday *Septemb.* 20*th.* 1676, between ſeven and eight of the clock at night. In the duſk of the Evening (about Candle-lighting) there appeared a ſudden light, equal to that of Noon-day; ſo that the ſmalleſt pin or ſtraw might be ſeen lying on the ground. And, above in the Air, was ſeen (at no great diſtance as was ſuppoſed) a long appearance as of fire; like a long arm (for ſo it was deſcribed to me) with a great knob at the end of it; ſhooting along very ſwiftly: and, at its diſappearing, ſeemed to break into ſmall ſparks or parcels of fire, like as Rockets and ſuch Artificial Fire-works in the Air are wont to do. 'Twas ſo ſurprizing, and of ſo ſhort continuance, that it was ſcarce ſeen by any who did not then happen to be abroad. 'Twas judged, by him from whom I firſt heard of it, (for I had not the hap to ſee it my ſelf,) to continue about two or three minutes: But, I find he took a minute to be a very ſhort time, (little more than a moment.) From others I am told, it was ſcarce longer than while one might tell fifteen or twenty at the moſt; which will be leſs than half a minute. All this might happen well enough from ſome Fiery *Meteor* in our Air; as a *Draco volans* (as ſome have been pleaſed to call this) or the like. But that which makes it to me the more ſurprizing, is this; that I find the ſame to have been ſeen in moſt parts of *England*, and at or near the

ſame

ſame time: As, not only in *Oxford* and *Oxfordſhire*, but alſo in *Northamptonſhire*, *Glouceſterſhire*, *Worceſterſhire*, *Somerſetſhire*, *Devonſhire*, *Hampſhire*, *Suſſex*, *Surrey*, *Kent*, *Eſſex*, and (particularly) by the Water-men on the *Thames* in their paſſage between *Graveſend* and *London*. In how many other parts of *England*, or in what parts out of *England* it might be ſeen; I have not yet heard. But this is a great breadth of ground, and too much for an ordinary Meteor in our lower region of the Air to be ſeen in at once: Yet (for ought I hear) it is agreed by all to have been ſeen at the ſame time, between ſeven and eight at night the ſame day, in the dusk of the Evening. Which argues, that either it was higher than they imagined, (though the light of it reached the Earth) or elſe, that it had a very ſwift motion. This made me then conjecture, (what in thoſe Letters I ſignified,) that it might be ſome ſmall Comet, whoſe *linea trajectoria* paſſed very near our Earth, or upon it. And I therefore enquired from you, what news might be heard of it from beyond the Seas, or in parts of *England* further off, and what more particular account thereof you might have from the variety of your Correſpondents. For I judged it not improbable, that it might, when further diſtant from us, appear in the form of a Comet. That Comet, which hath now appeared, in this and the laſt month, confirms me in the ſame opinion; which I conjecture may be the very ſame which paſſed by us in *September* laſt. Why it was not ſooner ſeen, I cannot tell; ſave, what is the common fate of moſt Comets, that they are ſeldom obſerved till after their neareſt diſtance from us: And, perhaps, it may have been ſo near the Sun (as to its viſible place) as not to be much above our Horizon ſave in the day time. And for the like reaſon it may be, that in *September* laſt, when it paſſed by us, it was not more ſeen abroad in other parts; it might paſs them in the day time, being but in the Twy-light with us; and, had it been one hour ſooner, the day-light would have hindred us from ſeeing it. Which way its motion was when near us, I cannot conclude, ſo as to ſatisfie my ſelf. For moſt that ſaw it, being ſuddenly ſurprized, took little more notice of it than that it ſuddenly appeared and was ſuddenly gone, but ſaw it ſo little time as ſcarce to mark which way. By the account I had from one in *Northampton-*

ſhire (between *Brackly* and *Banbury*,) it ſhould ſeem to have moved there towards the South-weſt. By the account I had from one who ſaw it in *Hampſhire* (between *Wincheſter* and *Southampton*) it ſhould ſeem to be towards the South-eaſt; from others I have nothing of certainty, and therefore can conclude nothing. (Its motion might then ſeem to us the ſwifter, if its proper motion were then one way; and the Earths motion here, at the ſame time, contrary to it. And it is not impoſſible, that its daſhing againſt the Earth might diſturb its motion; as when Clouds, in their paſſage, meet with Mountains.) By this time I ſuppoſe it may be gotten ſo far from us that its apparent motion is very little. And ſo late it was before we heard of it here, and it is now ſo ſmall, and ſo near the Sun, and the weather withal hath been ſo cloudy, that I (and ſome others who would willingly have ſeen it) have not had the hap to ſee it at all. My conjecture upon the whole, though perhaps but a conjecture, hath at leaſt ſo much of probability in it, as to deſerve ſome conſideration: and may ſerve (if true) to give us ſome light into the nature of Comets; which perhaps will ſeldom have been found to come ſo near us, as this ſeems to have done. I add no more, but that I am

Yours, &c.

John Wallis.

An

An Account of four ſorts of factitious Shining Subſtances, communicated to the Publiſher from very good hands, both in printed Papers and in Letters not printed.

TWo of theſe four ſubſtances have been already ſpoken of in two of the late *Tranſactions*, vid. *Numb.* 131. *p.*788, and *Numb.*134.*p.*842; and they are, one of them, the *Factitious Paſte* of Dr. *Balduin*, ſhining in the dark like a glowing Coal, after it hath been a while expoſed to the Day or Candle-light; the other, the *Bononian* Stone calcin'd, which imbibes light from the Sun-beams, and ſo renders it again in the dark, whereas the former needs no Shining Sun, but doth the effect in quite overcaſt weather and even in a miſty day. To theſe we ſhall now add two other ſorts. The *one* is by the *Germans* called *Phoſphorus Smaragdinus*, ſaid to be of this nature, that it collects its light not ſo much from the Sun-beams, or the illuminated Air, as from the Fire it ſelf; ſeeing that, if ſome of it be laid upon a Silver or Copper-plate, under which are put ſome live coals, or a lighted Taper, it will preſently ſhine, and if the ſame matter be ſhaped into Letters, one is able to read it, The *other* is called *Phoſphorus Fulgurans*, which is a matter, made both in a liquid and dry form, and not only ſhineth in the dark, and communicates a ſudden light to ſuch bodies as 'tis rubbed upon; but, being included in a Glaſs-veſſel well cloſed, doth now and then fulgurate, and ſometimes alſo raiſe it ſelf as 'twere into waves of light: Differing very much from the *Balduinian* Stone, which is to be expoſed to ſome ſhining Body, as the Day, the Sun, the Fire or ſome lighted Candle, to receive light from thence; whereas this Fulgurating ſubſtance carries its light alwaies with it, and when put in a dark place, preſently ſhews the ſame. Of which we have this further aſſurance given us, that a little portion of it, having been kept two whole years, hath not yet loſt its power of ſhining: So that 'tis believed, if a conſiderably big piece were prepared of it, it would ſerve for a perpetual, or, at leaſt, a very long-laſting light.

So far this communication; the effect of which 'tis hoped will in due time appear here amongſt us, if the Author be competently encouraged thereunto.

Signor

Signor *Cassini*'s Letter, giving some Account of the Observations made at *Paris* of the late Comet.

NUlbes, *quæ mense præterito matutino tempore Horizontem tenere consueverant, impedimento fuêre quo minùs Cometam ante diem* 28 Aprilis *videre potuerimus. Illum* D. Romer, *occasione observationis* Satellitum Jovis *habendæ, primùm advertit, &, me statim de rei novitate admonito, horâ* 4. 6'. 31''. *post mediam noctem, ejus altitudinem accepimus graduum* 12. 22'. 10''. *Cùm Instrumentum direxissem ad observationem Azimuth Cometæ, illud, antequam observationem absolverem, commotum à curioso familiari, restitui non potuit priusquam Cometa disparuerit: Judicavi tamen, fuisse in verticali declinante ab ortu ad septentrionem grad.* 33. *circiter.*

Die 29 *manè, momento per nubes à* D. Picardo *visus est, horâ* 3. 9'. 31''. *post m. n. in altitudine graduum* 4. 39'.

Die 2 Maii *manè, ascensione rectâ medii Cœli ex fixis existente gr.* 267, *altitudo Cometæ erat gr.* 4. 5'. *Distantia verticalis à septentrione ad ortum gr.* 42. 8'. *circiter.*

Die 4 *manè horâ* 3. 30'. *p. m. n. altitudo Cometæ fuit gr.* 5. 33'. *Distantia azimuthalis à sept. ad ortum gr.* 42. 32'. *circiter.*

Die 5 *h.* 3. 32'. *altitudo Cometæ fuit gr.* 5. 10'. *Distantia azimuthalis à septent. ad ortum gr.* 44. 10' *circiter.*

Deinceps tempus nubilum manè & vespere Cometæ observationes invidit.

Quæ habitæ sunt, ob temporis angustiam optatam exactitudinem habere non potuêre. Illæ tamen initio Cometam reponunt in Triangulo, postremò propè caput Medusæ, ostenduntque Cometam procedere secundùm *Signorum seriem per lineam proximam, & ferè parallelam illi quam descripsit Cometa Anni* 1590 *mense* Febr. *Magnitudo capitis visi Telescopio videbatur fermè æqualis* Jovis *disco, aut paulò minùs; nec perfectè rotundum apparebat, sed figuræ ovalis, longiore diametro horizonti parallelo; quod refractioni horizontali videtur tribuendum.*

Coma ejus, Telescopio visa, latior, & fermè parabolica; nudo autem oculo angusta, & parùm inflexa ad occasum videbatur.

Monsieur

Monsieur *Hevelius*'s Letter written to the Publisher, containing his Observations of the late Comet, seen by him the 27, 29, and 30 *April*, and the first of *May*, 1677. (st. nov.) in *Dantzick*.

NUper reditum illius miræ Stellæ in collo Ceti *vobis, Amice honorande, significabam: Nunc verò de apparitione novi cujusdam* Cometæ *vos certiores faciam. Prodiit namque hisce diebus Sidus Crinitum, quod primâ vice hic* Gedani *die* 27 April. *manè ab horâ* 2 *matutinâ ad* 3. 30'. *usque animadversum fuit. Die subsequente* 28 April., *nulla ratione, ob cœlum omnino nubilum, phœnomenum istud observari potuit; at verò die* 29 April. *manè, existente cœlo aliquanto benigniori, licèt non omnimodò defæcato, pro viribus illum dimensus sum. Oriebatur, vel potius in oculos incurrebat, horâ* 1.52', *Mesaquilonem versus (h.e.* Nord often tot norden) *capite quidem haud adeò amplo, sed tamen satis splendido, ex unico nucleo clarissimo composito, ad instar illius, Anno* 1665. *conspecti. Caudam lumine notabilem radiis divaricatis sursum versus, duorum ferè graduum, exponebat. Linea directionis continuata caudæ inter* Alamac, *lucidum sc. pedem* Andromedæ, *ejusque cingulum incedebat, & quasi distantiam harum Stellarum in duas æquales partes secabat. Versabatur eo tempore supra caput Arietis in* Triangulo, *inter apicem & borealiorem in ejus basi, nempe in* 5 *gradu Tauri, & in latitud.* 19 *grad. Bor. Distabat hoc tempore à Sole secundum longitudinem tantummodò* 5 *grad., suo circulo verò maximo* 20. *Hincque cùm adeò vicinus hic Cometa extiterit soli, haud potuit longiorem caudam, ut ut meâ opinione reverà longè prolixiorem habuerit, ostendere, imò ut puto proximis diebus aliquantò adhuc breviorem ostendet. Die* 30 April. *etiamsi cœlum non omninò serenum extiterit, observatus est, eâ diligentia quâ tum fieri potuit, tam majoribus* Organis *Astronomicis quàm Tubis* 12 *atque* 20 *pedum: Deprehensus itaque in* 9 *grad.* ♉, *& latitud.* 18 *bor. ferè; à Sole existente in* 12 ♉; *caudam rursùs duorum grad. & aliquanto longiorem, ad borealiorem in basi* Trianguli *extensam (quæ Stella planè in cuspide caudæ per Tubos optimè conspecta) exhibebat. Die* 1 Maii *hac ipsâ die ab horâ* 2.32'. *matut. denuò diligenter observatus à me est, à lucido latere* Persei, Capellæ, Scheat Pegasi, *& capite* Andromedæ; *hincque in* 11 ♉ *repertus, sub latitudine boreali* 18, *in ipsâ propemodùm conjunctione Solis, totidem quoque gradibus à Sole distans. Caudam*

adhuc

adhuc satis lucidam referebat, sed paulò breviorem, ut ut latiorem, quam ad lucidum pedem Andromedæ exporrigebat.

A die 29 April., *quâ primum à me observatus, ad hunc usque diem* 1 Maii, *motu proprio propemodum* 5°. 30'. *absolvit; num autem successu temporis motum velociorem an tardiorem inierit, haud ità accuratè affirmare nunc queo: cùm intermedia observatio, ob cœlum tum nubilum, non adeò certa mihi videatur. Subsequentes igitur observationes id brevi ostendent exquisitiùs.*

Quantum ex duabus observationibus conjicere possum, vel potiùs mihi divinari datur, fertur motu directo ad sinistrum pedem Persei, *supra* Taurum, *ad pedes* Geminorum, *si eo usque perdurabit. Nodus descendens versatur circa* 20 *grad.* Geminorum (*sed ruditer id tantummodò refero*) *atque sic ibidem* Eclipticam *pertransibit, fietque tum Meridionalis, sub inclinatione orbitæ* 27 *ferè grad. Hoc ipso vespere, dabo operam, ut eum etiam in* Occidentali *plagâ, ut ut à nemine adhuc visus fuerit, deprehendere possim: Fortassis successu temporis aliquanto meliùs ibidem in conspectum veniet; sed in situ decliviori & crepusculo vespertino,* Hypocircium *videlicet versùs,* (*h. e.* Nordwesten to Norden) *hac tamen conditione, si nimirum in eo motu, velocitate, nec non tramite persistat; atque sic simul matutino simul vespertino tempore nos illum conspecturos confido. De quibus tamen omnibus longè certiora, quando plures Observationes, Deo favente, impetravero, significare vobis potero: Hæc quæ dicta fuêre, tantummodò divinare valui; num verò benè, an malè auguratus fuerim, tempus docebit. Quid vestrates Astronomi de hoc cometâ, & an illum citiùs, an tardiùs deprehenderint, avidissimè à vobis pariter expecto. Illustrissimam* Regiam Societatem, *Patronos, Fautores Amicosque omnes saluta quàm officiosissimè ab ejus devinctissimo & ad quævis studia atque Officia paratissimo Socio,* Joh. Hevelio.

Dabam raptim, ut vides, horâ 6 matutinâ die 1 *Maii*, statim post Observationes habitas, propter Tabellarium stantem in procinctu, Anno 1677. *Gedani.*

Another

Another Letter from the same hand, upon the same Subject with the former.

Illustri Viro
Dom. *Henrico Oldenburgio*,
Illustrissimæ Regiæ Societ. Secretario,
amico honorando, *Joh. Hevelius*, S.

Literas meas, die 1 Maii *nuper datas, spero Te optimè accepisse, atque ex iis intellexisse, Cometam hîc* Gedani *die* 27 April. *primùm illuxisse: nunc ad continuandam hujus phænomeni Historiolam nonnulla adhuc addam, quid videlicet cum ejus cursu contigerit, & quando planè hîc visui sese subduxerit. Atque ita die* 1 Maii *vesperi, uti in dictis literis vobis perscripseram, sperabam me Cometam quoque observaturum, ut ut in decliviori situ; sed adversa aëris temperies, id omninò tum impediebat: At verò die* 2 Maii *vesperi, Cælo rursùs sereno, horâ* 8. 45′, *etiamsi eâ in parte Cæli, nullæ adhuc Stellæ emicarent, intensumque crepusculum existeret, nihilominùs Cometam Tubo Optico ivimus quæsitum, quem etiam protinùs inveni, sicuti omnes spectatores testabuntur. Paulò post, illum in altitudine* 3. 30′ *sextante majori, à* Capella & Lucidâ Cathedræ Cassiopeæ *dimensus sum: Caudam referebat, ratione crepusculi, valde tenuem, quam inter utrumque genu* Cassiopeæ, *propius tamen sinistro exporrigebat: occidebat eâ vesperâ horâ* 10 *Circium versus, h. e.* Nord Nord west. *Die* 3 Maii *mane, Cælo rursùs perquàm sereno Cometa oriebatur Boream versùs, h. e.* Nord Nord ost, *horâ scilicet* 1. 23′, *quanquam Cauda paulò citius à nobis detecta, nempe hor.* 1. 18′; *observatus est à* Capella, Lucido Latere Persei, & Lucida Cathedræ Cassiopeæ, *versabatur in* 14 *grad.* ♉, *cum Sole ferè in ipsâ Conjunctione, Latitudinem habens* 17 *grad.*, *& tantam etiam distantiam ferè ab ipso Sole. Caudam hâc die longè prolixiorem & acutiorem satisque splendidam* 2 *vel* 3 *ferè grad. ostendebat. Hincque à me aliisque spectatoribus visu pollentibus nudo oculo ad hor.* 3. 34′ *deprehensus est, & Telescopio ad hor.* 3. 40′, *in altitudine* 11°. 30′; *adeò ut Sol eo tempore tantummodò* 6 *grad. infra horizontem lateret; imò diutiùs illum vidissemus, nisi nubeculæ illum nobis eripuissent: Motus diurnus decrescere videbatur, quantum conjecturâ absque omni calculo assequi potui. Nam inter* 29 *&* 30 April. 2°. 45′ *ferè extitit; inter* 30 Apr. *&* 1 Maii 2°. 15′; *inter* 1 *&* 2 Maii 1°. 55′; *inter* 2 *&* 3 Maii 1. 40′; *sed ipsæ observationes calculusque id clariùs ostendent. Die* 3 Maii *vesperi Cælum minimè erat serenum; die vero* 4 Maii *vesperi, aëre admodùm sudo, horâ* 8. 53′, *iterum Cometa detectus, sed obscurior paulo extitit, quàm diebus præcedentibus, tum Cauda*

 brevior;

brevior ; dimensus eum sum à Capellâ, *&* Lucidâ Cathedræ Cassiopeæ. *Die* 5 Maii *mane horâ* 1.41'. *Cometa primùm apparuit, ob obscuriores scilicet nubes horizontem insidentes ; observatus rursùs est, à* Capellâ, Cingulo Andromedæ, *&* Lucido Latere Persei, *caudam dextrum genu* Cassiop. *versùs exponens ; versabatur in* 17 ♉, *in* 16 *Latit. Bor., pariter in tantâ distantiâ à Sole ; motus proprius à die* 3 *ad* 5 Maii *fuit ferè* 2°.40', *decrescente Latitudine, ab ipso initio scilicet ferè ad* 3 *grad. ; sic ut in* 29 April. *motus proprius Cometæ ad* 5 Maii *propemodùm fuerit* 12 *grad. Eâdem die vesperi clarè quidem rursùs illuxit, sed minimè, ob gravissimas occupationes, observatus. Die* 6 Maii *mane, rursùs illum dimensus sum ; sed ruditer tantùm, ob nubes, à* Capellâ *inprimis &* Lucidâ Cathedræ Cass.; *commorabatur eo tempore in* 18° ♉, *&* Latit. Bor. 15°.30', *Sole existente in* 17° ♉ ; *motus diurnus erat* 50', *circit. Quoad caput, quàm caudam multò tenuior ac debilior videbatur, ob Solem non nisi* 16½ *grad. à Cometâ remotum. Die* 6 Maii *vesperi visus quidem Tubo Optico hor. sc.* 8. 35', *cauda adhuc breviori & dilutiori ; sed cùm in decliviori situ, atque in crepusculo intenso existeret, nullo modo distinctè in nudos incurrebat oculos. Die* 7 Maii *deprehensus primùm hor.* 2. 22' *in altitudine* 3° ; *observabatur rursùs à* Capellâ, *&* Lucido Latere Persei, *ut ut valdè tenuis videretur ; occupabat eo tempore* 19° ♉, *in Latitudine* 15° *Bor., & distantiâ à Sole* 16° *ferè, Sole existente in* 18 *grad.* ♉ ; *motus ejus proprius magis magisque decrescebat. quantum colligere absque calculo dabatur. Die* 8 Maii *mane ab hor.* 1. *sedulo nudis quæsitus est oculis, sed nusquam apparuit, Telescopio tamen* 12 *ped. inventus, caudam quidem adhuc præ se ferens, sed brevissimam, paulò à circulo verticali sinistram versùs extensam. Quantum conjectura assequi potui ; versabatur in* 20° ♉, *in distantiâ à Sole* 15°, *qui tum* 19 *gradum* ♉ *possidebat ; stabat ferè hoc tempore in lineâ rectâ, cum humero dextro* Persei, *&* Algol. Medusæ, *exquisitè tamen à fixis observari hodie haud potuit. Diameter Cometæ, ad* Jovis *diametrum comparata, vix ad dimidiam partem accedebat. De reliquo, Tubi beneficio satis erat adhuc conspicuus, adeò ut eum ad hor.* 3. 45' *distinctè conspicere potuerimus, in altitudine scilicet* 9° *ferè : unde colligere datur, arcum visionis vix* 5° *tum fuisse. Sol enim vix* 5 *grad. sub horizonte hærebat, quo tempore omnes jam Stellæ, excepto unico* Jove, *evanuerunt : Sol oriebatur limbo suo superiori hor.* 4. 6' *ferè. Die* 8 Maii *vesperi Cometam nec nudis oculis, nec ullo Telescopio detegere amplius potuimus. Die* 9 *mane & vesperi, ut ut anxiè quæsitus, nullâ tamen ratione conspectus ; nec die* 10 Maii ; *sic ut certum*

tum fit, Cometam hunc die 8 *mane à nobis hîc* Gedani *ultimùm esse deprehensum, & non nisi per* 12 *dies, nimirùm à* 27 Aprilis *ad* 8 Maii *in Cœlo fulsisse; quanquam, meâ opinione, multò citius detegi potuisset, si cœlum nobis annuisset: Cùm circa* Piscem Boreum, *sub* Andromedâ *adhuc versaretur; pariter longè diutiùs conspectus fuisset, si cursum suum motu retrogrado instituisset; verùm cum indies motu directo Solem versùs latus fuerit, & in Conjunctione Solis ferè continuò hæserit, haud potuit ampliùs videri. Atque hæc sunt, Amice honorande, quæ hâc vice, rudiori modo, de hoc Cometâ Illustriss. Regiæ Nostræ Societati, cum omnigenæ felicitatis voto, significare submisse volui. Quid Vos in* Angliâ, *vel alii in* Galliâ *&* Italiâ, *de hocce Cometâ annotastis, rursùs à Te avidissimè, prima occasione, expecto.*

Dabam *Gedani* Anno 1677. die 13 *Maii*, st.n.

Mr. Flamstead's *account of his Observations of the late Comet, sent in a Letter to the Publisher,* Greenwich, *May* 18. 1677.

SIR,

I Have this day received a Note from Sr. *Jonas Moore*, in which he informs me, that you have received Papers concerning the late *Comet* both from Mr. *Hevelius* and Mr. *Cassini*, and that you desire to know what I observed of it. I am glad to hear you have accounts of it from two such able persons, who having observed and made theories for the Comets which appeared near the same place twice of late at twelve years interval, *viz* in 1653, and 1665, may best inform us, what conformity there is betwixt the Motions of this and them, and whether it may probably be the same returned hither after two revolutions; or another: My Observations of it, by reason of our cloudy Nights, were so few, that I can determine nothing from them; however perhaps they may be of use to others, who had more frequent opportunities, and therefore such as they are, they are at your service.

The first time that the *Comet* was taken notice of with us, that I can hear of, was about the middle of our *Easter* week; I believe it might have been observed long before, had not the unwonted cloudiness of our Heavens (which has permitted me to observe but 4 of almost 50 appulses of the Moon and Planets to fixed Stars foreseen hitherto) prevented. The first certain notice I had of it was on *April* 21. I waited the rising of the Comet; but immediately after midnight the Heavens were over-

ſpread with Clouds and continued ſo till Sun-riſe, next Morning, preventing me of my deſires. The next Night *April* 22. I again waited for its riſing, the Heavens being now exceeding ſerene and clear: at about 2 a Clock after the Midnight following I ſaw the Tail raiſed almoſt perpendicular to the Horizon; ſoon after the Head appeared through a thin vapor, from which the Tail pointed as near, as I could gueſs, upon the * in the *knee* of *Caſſiopea*, its length being about 6 degrees, and breadth at the top about 7 or 8 minutes. Viewing the Head with a Teleſcope of 16 foot, I found it was not perfectly round, but indented, and not near one minute diameter. Afterwards I haſted to meaſure its diſtances from ſeveral fixed Stars, which were as follow:

April 22.

h. ′ ″		° ′ ″
14.44.00	its head and the foot of *Androm. Alam.*	11.26.
47.15	that diſtance repeated	11.26.50
55.03	its head from *Capella*	31.01.15
59.10	——— ——— repeated	31.01.24
15.12.02	its head from *Algol* in *Meduſa's*	8.16.54
21.22	——— from *Mirach*	19.35.
27.54	——— from *Alamech* again	11.33.30
15.36.20	——— from *Capella* again	30.59.45

At h. 15. 21′ p.m. the height of the Comet was about $5\frac{0}{1}$ degr. therefore the diſtance of the head of the Comet from *Algol* correct by refraction, —— 8° 19′

from *Mirach*, —— 19 37

And admitting with Mr. *Hevelius* the place of *Mirach* now in ♈ 21° 40′ 34″, with North latitude 25° 57′, its diſtance from *Algol* will be 23° 42′ 40″, and the place of the Head of the Comet in ♉ 14° $48\frac{1}{6}$′, with North latitude 17° 08′.

At 15h 28′ I ſtate the correct diſtance of the Comets head from *Capella* 31° 00′, from *Alameck* 11° 40′; and therefore its true place in ♉ 14° $50\frac{1}{2}$′, with North latitude 17° 06′ 25″, agreeing very well with the place derived from the former diſtances from two other and different Stars.

The Tail was not, it ſeems, directly oppoſite to the Sun, for the Suns place was now ♉ 30° 07′; but the Comet being in 14° 47′ of the ſame Sign, that is 1° 40′ in conſequence of the Sun, the Tail ought, if it had been exactly oppoſite to the Sun,

to

to have lain in consequence of the head; but the *knee* of *Cassiopea* is now in ♉ 13° 24′ in antecedence of the Comet, whose Tail lay not therefore in consequence, but in antecedence of the line passing through its head and the Sun, at about an angle of 10 degrees.

Next Night, being that following the 23 of *April*, I again waited for the Comets rising; but the Heavens were thick of scattered Clouds, and most where the Comet rose, so that I almost despaired of seeing it; till about ¾ of an hour after two I saw its Tail, which appeared much shorter than last morning through a break of the Clouds; which soon after opening wider I saw the head too, and hasting I measured its distance. *April* 23 at 14ʰ 51′ *p. m.* from *Mirach* 21° 09′; but before I could get the plain of the Sextant to *Algol*, the Clouds came over the Comet again, and I could see it no more.

Hence, and from a course Observation of it sent me by an ingenious Friend, I found its motion was direct, and its latitude decreasing. I hoped nevertheless I might see it again in the Evenings following, and waited for it; but though they proved sometimes clear I could never find it, and I believed, that hence forward to us it would be unobservable.

An Account of some Books:

I. *The Natural History of* OXFORDSHIRE, *being an Essay toward the* Natural History *of* ENGLAND: *By* Robert Plot, *LL. D. Printed at the Theater in* Oxford, 1677, *in fol.*

THe worthy and learned Author of this Work, having very generously undertaken to make a fuller and stricter survey of the Natural and Artificial things of *England*, than hath been made hitherto, and being induced to this undertaking by the consideration of advancing thereby both the knowledge of *Nature*, and the business of *Trade*; hath begun to execute this Noble design by giving us a very particular account of what occurred to him, for the most part upon his own personal enquiry, in *Oxfordshire*. An attempt so considerable, that if it were pursued by fit persons all over the World with care, judgment and diligence, would in time produce a just *History of Nature*, and furnish both the Philosopher with good Materials to work with, and generally all sorts of men with the pleasant and useful knowledge of the riches and wonders of the World.

The

The Method, obſerved by our Author in this County, and doubtleſs to be obſerved by him in others, is, that he conſiders, 1. Natural things, ſuch as Nature either hath retained the ſame from the beginning, or freely produces in her ordinary courſe, as *Animals*, *Plants*, and the *univerſal Furniture of the World.* 2. Nature's *Extravagances* and *Defects*, occaſioned either by the Exuberancy of matter, or Obſtinacy of impediments, as in *Monſters*. 3. As Nature is reſtrain'd, forced, faſhion'd, or determined by *Artificial* Operations.

More particularly he obſerveth what is remarkable in the Heavens and Air, in Waters, in Earths, Sands, Clays, Stones: Again, in Trees and Plants, where he diſcovers ſeveral, unknown before at the *Oxonian* Phyſick-garden, and others not ordinarily found in this County; together with divers unuſual grains ſown in the ſame. Moreover, in Animals, with things uncommon, attending them. To all which he ſubjoyns many things of *Art*, he met with in this Country.

To give the Reader, out of this curious and vaſt Collection, a few Samples; I ſhall take notice, of an Echo, repeating diſtinctly 17 ſyllables in the day time, and twenty in the night, in *Woodſtock-park*: Of Petrifying waters at *North-Aſhton*, *Sommerton*, *&c.* Of a ſort of Sand, which when waſhed and duly order'd, is ſold by retail at 20 ſhillings a Buſhel, at *Kingham*: Of excellent Fire- and Weather-ſtones, at *Teynton* and *Horton*: Of Marble, at *Bletchington*: Of *Lapides Judaici*, at *Hedaington*: Of two ſorts of Pear-trees, bearing twice a year, the one at *Stanlake*, call'd the Hundred pound pear, the other at *Latchford*, called the Pear of Paradiſe: Of a rath-ripe *Barley*, ſow'd and return'd again into the Barn in two months time, fetched from *Patney* in *Wiltſhire*: Of a great ſpreading Oak, from boughs end to boughs end 108 feet; under the ſhadow of which, 4300 men may ſufficiently be ſhelter'd: Of a great Old Elm in *Magdalen*-Colledge Grove, barked quite round for many years, and pithleſs, yet lives; and of another great Elm having three Trunks, iſſued out of one root, in St. *John Bapt.* Colledge in *Oxford*: Of a white Linnet, at *Deddington*: Of two Salmons, the one ſomething above, the other ſomething under, a yard in length, catch't in a ſmall Brook that a man may eaſily ſtep over, not above one furlong from the Spring-head, about 200 miles from the Rivers mouth, at *Lillington-Lovel*:

Of

Of a Hog near thirteen hands high, at *Upper-Tadmerton*: Of a Cow, at *Newington*, which whilſt a Calf, before ſhe was eleven months old, produced another; which Animals carrying their burthen uſually no leſs than 9 months, we muſt either admit, that this Cow took Bull at ten or eleven weeks old, or that the Cow her ſelf was at firſt brought forth pregnant of another. Of Deer in *Cornbury park*, which being for a while (in part at leaſt) turn'd into a Cony-warren, the Deer upon it had all *dwarf* heads, the moſt of them irregular, though the Deer themſelves were well grown; but as ſoon as the Warren was deſtroyed by the preſent proprietor, the Deer came again to have as *fair branched* heads as any Deer whatever in the adjoyning Forreſt: Of a Woman of ſixty years old, brought to bed of a Son, both now living, at *Shetford*; and of another of 63 years old, then with Child, when the Author wrote: Of a Woman of 36 years of Age, married, wanting half an inch of a yard in height; born at *Milcomb*: Of ſome perſons, whereof three are in the hundred year of their age; one, died at the age of 103; another, of the age of 112; a third, of the age of 114 years: See p. 19 and p. 212.

Of the things of *Art*, I ſhall here take notice, 1. of Sr. *Chriſtopher Wrens* contrivance of a *Weather-clock*, in order to compoſe a Hiſtory of Seaſons; with obſervations which are the moſt healthful or contagious to Men or Beaſts; which, the harbingers of Blights, Mildews, Smut, or any other accidents attending Men, Cattle, or Grain; ſo that at length being inſtructed in the Cauſes of theſe Evils, we may the eaſier prevent or find remedies for them. 2. Of a Clock lately contrived by Mr. *John Jones*, which moves by the Air, equally expreſt out of Bellows: 3. Of Gunpowder invented by *Fryer Bacon*, and of the Teleſcope known to the ſame: 4. Of an Inſtrument of Sir *Chr. Wrens*, which meaſures the quantity of Rain that falls, which as ſoon as 'tis full, empties it ſelf; whereby at the years end it is eaſie to compute how much has fallen upon ſuch a quantity of ground for all that time; in order to diſcover the Theory of Springs, Exhalations, &c. 5. Of the Arts and Ways, by which the ſeveral ſorts of Soyls are tilled in *Oxfordſhire*. 6. Of the Manufacture of the Stone- or *Collen*-wares, as Bottles, Juggs, &c. as alſo of the diſcover'd Myſtery of the *Heſſian* Wares, whereby Veſſels are made to retain all ſorts of penetrating

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ting Salts and Spirits; likewise of an Art of making a certain *English* Earth as white and transparent as *Porcellain:* All three by Mr. *Dwight.* 6. Of an excellent way to prevent the firing of Ricks of Hay and Stacks of Corn; as also of several ways of preserving the latter from being eaten by Rats and Mice; whereof one is, by a peculiar kind of Rats-bane, that kills no Creatures but those for which it is designed, except *Poultry*: See *p.* 257, 259. 8. Of a successful way of grafting white *Frontiniac* upon the *Parsly* Vine; and the early *Red-cluster* or *Currant-grape* upon the *Fox grape.* 9. Of a way of fatting Hogs with so much husbandry and so little trouble, that they cannot spoil a Bean. 10. Of a Mill, that grinds both *Apples* for Cider, and *Wheat* to Flower, which it sifts at the same time into four different finenesses; as also *Oats,* which it cuts from the husk, and winnows from the chaff, into pure Oatmeal; lastly *Mustard.* All which is performed at *Tusmore* by one Horse and Man; together, or severally. 11. Of another Mill, that grinds Corn, cuts Stones, and bores Guns, altogether or severally, at *Hanwell.* 12. Of a very ingenious device of making flat floors or roofs of *short* pieces of Timber, continued to a great breadth without either Arch-work or Pillar to support them, being sustained only by the side Walls and their own texture; by which means many times the defect of *long* timber, or mistakes of Workmen, are supplied and rectified without any prejudice to the building; together with a demonstration of this Work, given by Dr. *Wallis* in his Book *De Motu.* 13. Of the rare flat Floor of the *Theatre* in *Oxford*, unsupported by Pillars, and whose main beams are made of *divers* pieces of Timber, from side-wall to side wall 80 foot over one way, and 70 the other, whose Lockages are quite different from any other, and in many other particulars perhaps not to be parallel'd. 14. Of the curious and significant Painting of the Theater, largely explained. 14 Of the Art of sinking a Colour a considerable depth into the body of polisht white Marble, by application of it to the outside only; by Mr. *Eird.* 16. Of an invention of *Etching*, perform'd in a very curious and speedy way, by Sir *Chr. Wren.* 17. Of Mr. *Lee*'s Loom of weaving Silk-stockings. 18. Of the *Banqueting* Trade improved at *Witney.* 19. An Account of the *Starch-trade* of *Oxford.* 20. Of a way of teaching deaf and dumb persons not only to understand what

they

they read, but also to speak and read intelligibly, by Dr. *Holder* and Dr. *Wallis*. 21. Of the Invention of an Universal Character, or Philosophical Language, by Mr. *Dalgarno* and Dr. *Joh. Wilkins*, late L. Bishop of *Chester*. 22. A straight line found out equal to a Cycloid, by Sir *Chr. Wren*; and a straight line found equal to a Curve, by Mr. *William Neil*. 23. A new Method, called the *Arithmetic of Infinites*, for the more expedit and effectual Inquiry into the Quadrature of Curvilinear figures, or other difficult Problems in Geometry, by Dr. *Wallis*. 24. Of considerable phænomena of Musick discover'd by Mr. *Pigot* and Mr. *Noble*, shewing, that though Viol- or Lute-strings rightly tuned do affect one another, yet most of them do it not in all places alike, as hath till now been supposed: Concerning which phænomena in all their cases, an exquisite solution hath been given by the Reverend and Learned Doctor *Narcissus Marsh*, Principal of St. *Alban Hall* in *Oxford*; which particular was for want of information omitted in *Numb.* 134 of these *Tracts*, where this matter was briefly spoken of, and from whence the Reader ought to have been directed for more satisfaction to this History, we are now describing; wherein 'tis fully deliver'd, *p.* 288, *& seqq.* 25. Of the Invention of the Lympheducts, by Mr. *Jollif* of *Oxford*. 26. Of the many excellent Discoveries, made by Dr. *Willis* in his Book of Fermentation, of the Brain, of the Soul of Brutes, of the Pharmaceutice, &c. 27. Of Injecting liquors into the Veins of Animals, by Sir *Chr. Wren*; and of Transfusing Blood out of one Animal into another, by Dr. *Lower*. To all which the Author would have added the mention of some of the many and new Experiments of the Noble Mr. *Boyle*, had he distinctly known, which of them were made by him at *Oxford*.

The whole is concluded with a particular Chapter of the *Antiquities* to be found in *Oxfordshire*; but having been already somewhat prolix in my account of this History, I must forbear to mention any particnlars of that Chapter, and desire the Reader, to repair as well for this, as many other considerable Observations, to the Book it self.

II. *L'ARCHITECTURE NAVALE, avec le ROUTIER des Indes Orientales & Occidentales: Par le Sieur* Dassié; *à* Paris 1677. in 4°.

THe Author of this Book would have his Reader look upon it no otherwise than a small Essay or Forerunner of abun-

dance of excellent reſearches of his Curioſity, which he ſaith he is preparing for the publick. His main deſign in this work he affirms to have been no other, than to reduce into Art, as methodically as he could, a Science ſo neceſſary and uſeful to the State, to render it familiar, and to quicken thoſe that are knowing in the Mathematicks and in Naval Architecture, to enquire after infallible ways of making Ships ſail better, and to find out the juſt weight of a Ships burden, and its true Symmetry, and ſo to bring this Art to perfection.

The Order, by him obſerv'd in this Treaty, is this: In the *firſt* Book he delivers the Terms of Geometry, and the Uſe of the Compaſſes neceſſary to repreſent the plan and the proportion of a Ship; as alſo the uſual Terms of Marine; the Definitions of the ſeveral ſorts of Veſſels; the Proportions and Meaſures of all the parts of a Ship, exhibited in their ſeveral figures; a general Deſcription of all the Inſtruments, Workmen, and other neceſſaries for equipping a Fleet to go to Sea; together with an account of the Charges of building a Man of War of 106, and of another of 115 feet by the Keel. To which is added a liſt of the Officers, neceſſary to command and defend a Man of War; as alſo the Number and Names of the Men of War and their Officers now in the ſervice of his *French* Majeſty.

In the *ſecond* Book, he gives the explication of the Terms for the building of a Gally and Chaloup; and withal enumerates the ſeveral parts of them, repreſented alſo by their figures; adding likewiſe a general Deſcription of all neceſſaries for fitting out ſuch Veſſels, ſo as to keep ſix Months at Sea; together with the Orders of his King touching the Salutes at Sea.

The *third* Book contains the Tables of Longitude and Latitude of Places, and likewiſe of the Tydes, and their Currents; together with the Routs, Courſes and Diſtances of the principal Ports of all the four parts of the World, and the Shallows, Rocks and other dangers therein.

And forasmuch as the Building of Ships ſerves principally for Trade, the Author hath, for the ſake of Merchants, annexed the *Routier* of the *Eaſt* and *Weſt-Indies*, extracted out of the moſt modern and beſt Authors, containing above 30 Navigations, together with the proper Seaſons to make thoſe Voyages, and the ſeveral Soundings, Ankerings, and Sea-ports: Promiſing withal to publiſh in due time another Treatiſe under the Title of, *The Stience of the Pilot.*

Having

Having thus given the Reader a general view of the whole, it may not be amiſs, to acquaint him with ſome particularities to be found in this Treatiſe. As,

1. That in the *firſt* part of it there is to be found a particular explication of the Proportion to be obſerved in the building of Ships from 60 feet by the Keel, to Ships of 140 feet; and likewiſe of the proportion to be obſerved for Men of War, from 400 Tuns upwards to 2000 Tuns; together with a *Table* to find the proportions for Men of War of the ſeveral rates, and for the ſeveral parts of them, and their reſpective Guns.

2. A Liſt of the *French* Fleet in the year 1671.

3. A Liſt of the Men of War built ſince the year 1671.

4. A particular Diſcourſe of the General motion of the Sea, which this Author, amongſt many others, affirms to be from Eaſt to Weſt, inclining towards the North when the Sun hath paſſed the Equinoctial Northward; and that, during the time the Sun is in the Northern Signs; but the contrary way, after the Sun hath repaſſed the ſaid Equinoctial Southward: Adding, that when this general motion is changed, the diurnal flux is changed likewiſe; whence it comes to paſs, that the Tides in divers places come in during one part of the year, and go out the other; as on the coaſts of *Norway* in the *Indies*, at *Goa*, *Cochin-China*, *&c.* where whilſt the Sun is in the Summer-ſigns, the Sea runs *to* the ſhoar, when in the Winter-ſigns, *from* it. On the moſt Southern coaſts of *Tunquin* and *China*, for the ſix Summer-months the diurnal courſe runs from the North with the Ocean; but the Sun having repaſſed the Line towards the South, the Courſe declines alſo Southward. Thoſe that ſail from the coaſt of *Peru* Weſtward, when the Sun is in the Equinoctial, have the Winds and Tides directly from Eaſt to Weſt, between the Tropicks, and in a little time Ships arrive from the *Molucques* to *Peru*. But when the Sun is in the Northern ſigns, the courſe of the Sea and the Wind tends Northward: And the Sun being in his greateſt declination, in the Tropick of *Cancer*, the Winds and Tides of the Eaſt extend themſelves unto the 30*th* degree of *Northern* Latitude, and ſometimes further. On the contrary, thoſe that ſail in the Southern Hemiſphere, are obliged to approach to the Line to meet the Eaſtern Winds. Again, when the Sun hath paſſed the Line Southward, the Eaſtern Winds and Tides extend themſelves unto the 40*th* degree of *Southern* Latitude; and therefore thoſe

that navigate in the Northern Hemisphere, are constrain'd in the *Pacifique* Sea to decline Southward to the Equinoctial, to meet the Winds and Tides of the East for the *Molucques* and *Philippines*.

5. Notice is taken, that, some years since, a motion hath been found in the Ocean, that gives a slight motion to the whole Ocean in general; not that 'tis visible, but yet sufficiently perceived by Pilots: Forasmuch as the *English* have observ'd, that they sail more speedily, with the same wind, in going from *England* to *Spain*, than from *Spain* to *England*. The *Spaniards* also have noted, that they sometimes went out of *Spain* into the *West-Indies* in 24 hours; but, that they could not return, how favourable soever the weather was to them, in less than four months.

6. Concerning the particular Voyages, described in the *Routier* above-intimated, they are, 1. A Voyage from *France* to the *Cape of Good Hope*. 2. From the Cape of *Lopo Gonsalues* to the River *Congo* and *Angola*, on the coast of *Guiny* and *Ethiopia*. 3. From *Lisbon* to *Malacca* in October, to arrive there in April, which is the time that the West-winds reign on the *Indian* Coasts. 4. From the Cape of *Good Hope* to *Mosambique* and *Goa*, when one passeth betwixt the Firm land and the Isle of St. *Lorentz*. 5. From *Mosambique* to *Goa* in August; unto the end of which it is good to part, without staying any longer. 6. From *Mosambique* to *Goa*, in the end of March. 7. From the Cape of *Good Hope*, without the Isle of St. *Laurentz*, for *Goa* or *Cochin*. 8. Voyage toward the coast of *Africa*, when the Ship is East of the *Garayes* and of *Saja de Malla*, the season being past, and the provision spent, so that there is no likelyhood of a possibility of arriving on the coast of *India*, and that one is constrained to winter at *Mombasa* or *Mosambique*, which is the shortest way that can be taken. 9. From *Mombasa* to *Goa*, in March and April. 10. A voyage that may be made, when a Ship comes in the after-season to the Cape of *Good Hope*, and takes her course between *Terra ferma* and St. *Laurentz*. 11. From *Goa* to the Cape of *Good Hope* by *Mosambique*, passing between the *Terra ferma* and St. *Laurentz*. 12. From *Cochin* to the Cape of *Good Hope* by *Mosambique*. 13. From *Goa* to the C. of *Good Hope*, by passing without St. *Laurentz*, which is the old rout. 14. From the Cape of *Good Hope* to *Lisbon*, by the Isle of St. *Helena*. 15. From the

Cape

Cape of *Good Hope* to *Lisbon* again, by the coast of *Angola*. 16. From *Angola* to *Lisbon*. 17. From *Lisbon* to *Malacca*, in October, to arrive there in April, which is the time of the West-winds reign on the *Indian* Coasts. 18. From *Lisbon* to *Malacca* in the season of February and March. 19. From *Malacca* to *Lisbon*. 20. From *Malacca* to *Macao* in *China*. 21. From the Isles of *Canton* and the coast of *China* towards *Nyngpo* and *Nanquin*. 22. From *Lampacon* near *Macao* towards *Japan*, as far as the Isle of *Firando*. 23. From *Macao* to *Japan* and the Isle of *Cabexuma*, as far as to the Haven of *Languasaque*. 24. What course is to be taken to enter into the haven of *Languasaque* in *Japan*. 25. Rout held by the Pilots from *Provence* to the *East-Indies*. 26. From the Isle of *Gomera*, one of the Canaries, to the *Antisles*, and thence to *Cartagena*, and *Nombre de Dios*, and so to the *Havana*. 27. The course and true marks from the Isle *Desirada*, as far as the coast of *Cartagena*, *Nombre de Dios*, *New Spain*, and the Canal of *Havana*. 28. From *Cape Vert* to *Brasil*, and to know the Coast and Havens of the said Country of *Brasil*, as far as to the River *della Plata*. 29. From *Todos los Santos*, on the coast of Brasil. 30. From *Rio des Ilhas*, on the same coast. 31. To the haven, *Porto Seguro*, on the same coast. 32. To the haven called *Spirito Santo*, on the same coast. 33. From *Spir. Santo* to the Bay of St. *Vincent*. 34. From the Cape *Frio*, as far as *Rio della Plata*, with the particulars thereof. 35. The Ankrings and Soundings in the Roads and Havens of the *Mare Glaciale* and the *White Sea*. 36. The Soundings of the Havens of the *Baltique*, and the *German* Sea; as also of the Coast of *England*, beginning from the *Cape* of *Cornwall*, and so on; likewise of *Ireland*, *France*, *Biscay*, *Gallicia*, *Portugal*, the Coasts of *Africa*, the Isles of *Tercera* and the *Canaries*, of *America*, and particularly of *Virginia*, *Florida*, and *New Spain*.

III. *Philosophical Dialogues concerning the PRINCIPLES of Natural Bodies*; *by* W. Simpson, *M.D.* Lond. 1677.

THE Learned and Industrious Author of these Dialogues endeavours to deliver in them a confirmation of the *Corpuscularian* Philosophy, taking-in *Seminal Principles* and *Ferments* to make up the generality of Mixt bodies in the World. Where he understands by *Seminal Principles* certain minute portions of *Acid* and *Sulphur*, concentred and wrapt up by the

Author

Author of Nature in ſmall rayments of Matter, which Principles are to him the Mechanical Agents included in all thoſe bodies commonly called *Seeds*; not but that theſe Principles themſelves are alſo material, and, in his opinion, ultimately reducible into *Water* (which he would have the Material Principle of all Concretes,) but with this difference, that they are pure and very ſubtile parts (engaged in groſſer ones) adapted for that motion; which he ſuppoſes abſolutely neceſſary in the fabrick of all Mixts. By *Ferments* he means the aforeſaid Principles, (or Seminal ſparks hidden in matter) actually put into motion, and by the variety of that motion producing the variety of bodies.

This ſignification of his Seminal and Fermental principles he illuſtrates by the Generation both of *Vegetables* and *Animals*; eſteeming the ſaid generation to be no other than a natural Evolution or Expanſion of the implanted Seminal principles contained in the minute Seed or *Embrio*, and rendred fruitful or prolific by the odour of a ſpirituous ferment. So that theſe Seminal Principles, carried on by a mutual colliſion of Mechanical Agents, are, to him, the very groundwork of all natural *Fire* in bodies, and that theſe little Fires, harboured in ſo many minute portions of Matter as there are variety of things, give motion and vigour to every body wherewith they are cloathed. Moreover, the Author conſidering Bodies in their Generation, and Mutation, and reducing them to their ſeveral *Claſſes*, he finds, there are ſeven Complications, or ſeven ways of Aggreſſions of his Principles, Acids and Sulphurs; and conſequently ſo many ſorts of Fires, hid in the boſom of things, according to thoſe ſeven Modifications of the Principles, by which they variouſly combine to the raiſing of bodies, and to the diſſolving of them again.

And theſe ſeven Complications he thus reckons up: The *firſt* is, when the Principles combine in ſuch a peculiar Colliſion, as that the *Ethereal* matter is interwoven therewith, and is fomented by a continual ſupply from the perpetual circulation of that Æther; of which ſort he makes the *Solar* Fires to be, becauſe made from the ſame principles that the Solar rays are: ſuch as Light and Heat in the Macrocoſm.

The *ſecond* is, when the aforeſaid Principles do accoſt each other by a *gentle* colliſion, either progreſſive from the Center,

as

as Generation; or retrogreſſive from the ſuperficies, as Putrefaction.

The *third* is, when the Principles by a *ſtronger* and more ſenſible colliſion hit each other; which he diſtinguiſhes into *Natural* and *Artificial*; the *former*, ſuch as is manifeſt among Vegetables in their ripened Juyces, whoſe principles ſtruggle (in our Authors language) with ſtronger colliſions: The *latter*, ſuch as is ſeen in every effervеſcence between factitious Alcalie's and Acids.

The *fourth* is the moſt high and rapid motion the Principles are capable of, and whence reſults the *ratio formalis* of Culinary or common Fire; and by which complication the phænomena belonging to that Fire, may be ſolved.

The *fifth* is, when the Principles, after they are by the moſt rapid colliſion brought to an ignition, are tranſmitted from their own into other bodies, where having penetrated, they are by a kind of fixation locked up, and ſo become the cauſes of divers *phænomena*; as it is apparent in the *Calces* of Mettals made in *forma ſicca*, as of Lead, Iron, Mercury, &c.

The *ſixth* is, when the Principles are complicated by a certain colliquation; thence by our Author called *Ignes colliquativi*, and by him diſtinguiſh't in *Cauſtical*, *Corroſive*, and *Putrefactive*. The *firſt* again into *Lixivial* (as the fixt Alcalies of Plants, fixt Nitre, *Calx vive*,) and *Veſicatory*, as Chymical Oyls, Cantharides, and ſome Plants. The *ſecond* (which are the *Corroſive*) take their original from Mineral principles colliquated by force of Fire; whence all corroſive *Menſtrua*. The third, namely the *putrefactive*, is made threefold again, *Peſtilential*, *Venemous*, and *properly Putrefactive*: Concerning all which, he refers us to his *Tentamen Phyſiologicum*, intended to be publiſhed by him.

The *ſeventh* and laſt complication is, when the Principles are fixed by an intimate and radical union; whence ariſe Fires *ſui generis*, which by reaſon of the fixity and the inſeparable connexion of the principles, ſuffer no deflagration of parts, nor any injuries by our ſtrongeſt fire; ſuch as to him are the *Philoſophical Elixir*, the liquor *Alkaleſt*, and the *Mercurius Philoſophorum*.

So far his Seven Complications; which whether they are conſonant to the nature of things, and comprehenſive enough to expli-

explicate all phænomena of the World by, must be left to the profeſſed and ſagacious Searchers of Nature to determine.

IV. *A New Treatiſe of* CHYMISTRY, &c. *written in* French *by* Chriſtopher Glaſer, *and now faithfully* Engliſhed *by* F. R. S. London, 1677. *in* 8°.

THis Author having reflected upon the cauſes, why many have declaimed againſt Chymical Writers and even againſt Chymiſtry it ſelf, maketh it his buſineſs in this Treatiſe to publiſh a ſhort and eaſie method for the happy attainment of all the moſt neceſſary preparations of Chymiſtry; aſſuring us, that the conſidering Reader ſhall find therein nothing tedious, ſuperfluous, or defective in any matter that deſerves to be known, and that, though indeed the Preparations of all Chymical matters cannot be found therein, yet ſufficient Examples of them will be had from it; affirming withal, that he hath deliver'd no operation, but what he has made and well experienced himſelf, and what any one, following the Rules by him preſcribed, may do after him.

As for the *Theory*, he ſpeaks ſuccinctly, yet ſeems to ſay ſo much of it as may ſuffice for direction to the Preparations: performing his operations on *Minerals*, *Vegetables*, and *Animals*, and proceeding therein orderly, without omitting any neceſſary directions.

Advertiſement.

DISTANCES WITHOUT SCALE and COMPASS: *A New large Map of* England *full ſix foot ſquare, wherein computed and meaſured Miles are entred in figures: Deſigned by Mr.* John Adams *in the* Inner-Temple. *Sold by Mr.* Gregory King *at the Eaſt corner-*Piazza *houſe of* Jame's-ſtreet Covent-Garden; *Mr.* John Smith *Teacher of the Viol and Guittar at the* Mermaid, *next door to the* Bull-head *Tavern in* Cheapſide; *Mr.* Thomas Baſſet *at the* George *near St.* Dunſtans *Church in* Fleetſtreet; *and Mr.* Richard Chiſwel *at the* Roſe *and* Crown *in St.* Pauls Church-yard. *Price ready made up Two Guinies.*

Imprimatur,

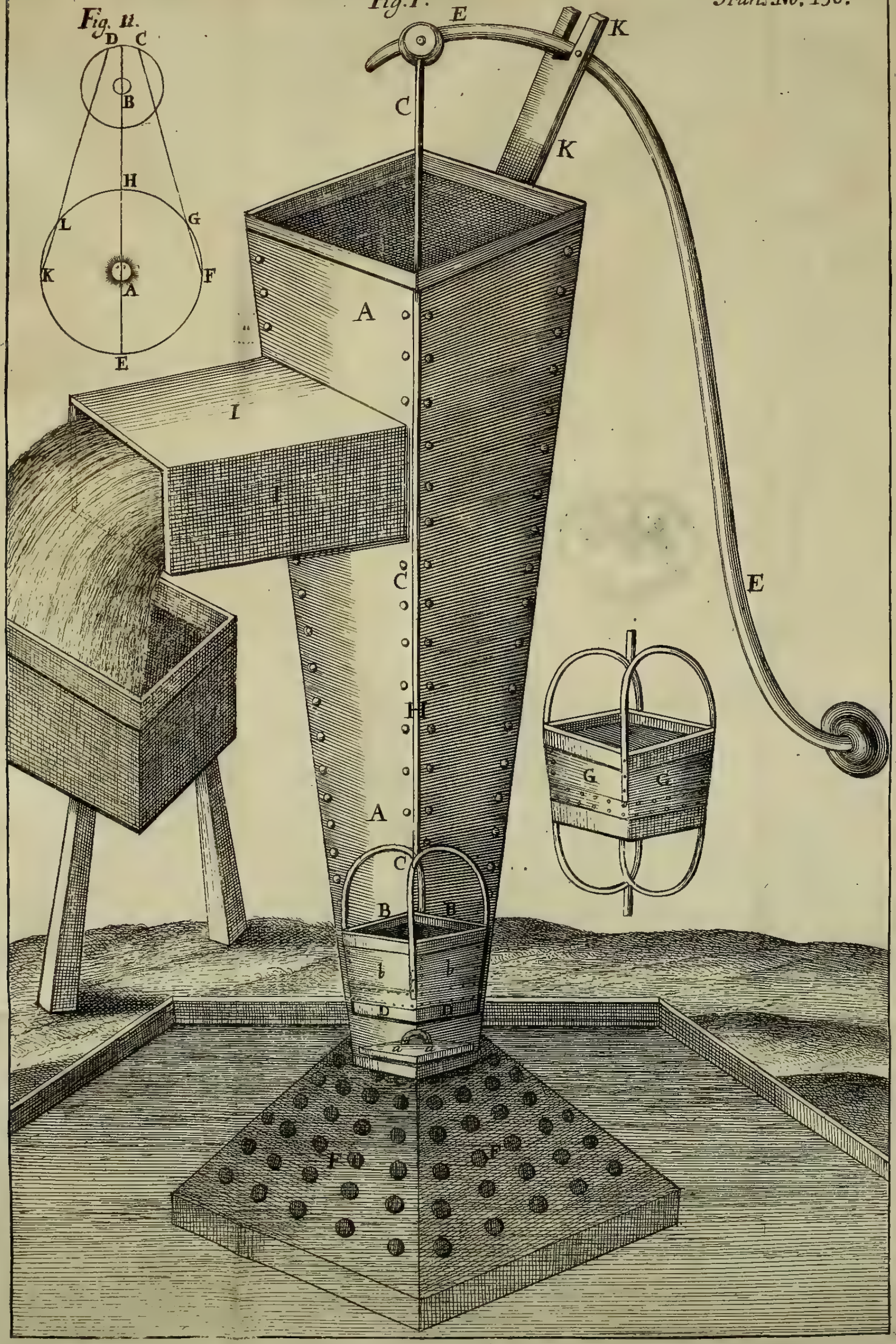
May 31. 1677. *JONAS MOORE* R.S.V.Pr.

London, *Printed for* John Martyn, *Printer to the R. Society*, 1677.

BRITISH MUSEUM
NATURAL H...

Fig. 1.

Fig. II.



PHILOSOPHICAL TRANSACTIONS.

June 25. 1677.

The CONTENTS.

A Letter of Mr. John Conyers, *containing an account of a very useful and cheap Pump, contrived by him, and also put in practice with good success. Some Considerations upon* Numb. 133 *of these Tracts. A Demonstration concerning the Motion of Light, communicated from Paris. A Relation of some strange* Phænomena, *accompanied with mischievous effects, in a Coal-work in* Flint-shire. *A Letter from Mr.* Leewenhoeck, *concerning some Observations by him made of the Carneous Fibres of a* Muscle, *and the Cortical and Medullar part of the* Brain, *as also of* Moxa *and* Cotton. *The Description of a Celestial Globe, artificially made, shewing the apparent Motions of the* Sun, Moon, *and* Fixed Stars, *&c. A Description of the* Diamond-*Mines, as it was presented by the Right Honourable, the Earl Marshal of* England, *to the* Royal Society. *An Account of some Books:* I. *The Primitive Origination of Mankind, considered and examined according to the Light of Nature; by the Honourable Sir* Matthew Hale, *Kt. &c.* II. *Tractatus Medicus de* MORBIS CASTRENSIBUS INTERNIS, *Auth.* Joh. Valentino Willio. III. *Hebdomas Observationum de Rebus* SINICIS, *Auth.* Andræa Mullero. IV. *The Curious Distillatory, written originally in Latin by* Joh. Sigism. Elsholt, *and Englished by* T. S. *&c.* V. Medicina Statica, *or Rules of Health, likewise originally written in Latin, now made English by* J. D. VI. Systema Horticulturæ, *containing in English the Art of Gardening in Three Books; by* J. W. *Gentl. &c.*

A Letter of Mr. John Conyers, *Citizen of* London; *the Author of the Hygroſcope deſcribed in* Numb. 129; *in which Letter is contained a Draught and Deſcription of a very uſeful and cheap* Pump, *contrived by the ſaid Mr.* Conyers; *a Trial of which was alſo made at the Repairing of the New Canal of Fleet-river in* London, *and elſewhere.*

SIR,

I Have here incloſed a Draught of a very uſeful and cheap Pump, which about the Year 1673 was by me contrived, and by my direction uſed and made at the New Canal of Fleet-river in *London* at the Work there, when the River was lately enlarged as now it is; and this Pump was then found to empty and raiſe at leaſt twice as much Water proportionably as thoſe of the ſame or rather bigger bore, that were firſt made uſe of and caſt by; for, *this* being Taper or Conical all the way, and *thoſe* Cylindrical, *this* would raiſe and caſt out twice as much Water at leaſt at one ſtroke, as the other Cylindrical ones would do with the ſame bore and ſtrength. Now you may diſcern by the faſhion, that, as there is no Braſs or Lead work here, ſo it will be purchaſed at a cheaper rate than uſual; and as there is liberty in the motion, ſo there will be no wearing or rubbing upon the ſides of the Bucket: Beſides this, you may with the ſame eaſe by which you caſt out of a cylindrical bore, caſt out twice as much at leaſt out of this: So that how uſeful this may prove for draining of Low grounds, Pitts, Mines, Fiſh-ponds, and for Shipping, Time and Experience muſt diſcover. This Engin was then recommended by Dr. *Francis Gliſſon*, as alſo by Dr. *Jonathan Goddard* to the *Royal Society*, whilſt it was uſed in the Canal aboveſaid.

Now this being the largeſt yet made about nine foot in length, and the ſmaller end or bottom-bore eight inches, and the top one foot eight inches bore, it was found to caſt out at leaſt eight Gallons at one ſtroke; and this was a Bore of a ſquared faſhion, being made of Planks nailed together, and Iron-hoops added to ſtrengthen it on the outſide; which alſo in proportion may be made to what length or breadth you pleaſe. Now, though the Bore be large at the top, there is no more weight of water that lies on the bore at bottom, than juſt the breadth there; the reſt is born up by the ſides, and the impulſe of Water by that means is made in the water without grating a-

gainſt

gainſt the ſides of the Veſſel; and ſo with much greater eaſe and ſwiftneſs. The Water in the ſame time is raiſed through a ſmaller paſſage, to anſwer an enlarging capacity from the top to be vented according to that large proviſion for delivery; and it ſhews, that Water moves eaſieſt in Water, and requires a conical or tapering liberty throughout for its largeſt disburſment in quantity and eaſe in that motion, and the differing ſwiftneſs makes amends for the difference of the bore; for it moves three times as faſt through the ſmaller bore in the ſame time, in anſwer to the delivery of the larger bore at the top.

It is to be obſerved, that no ſtrength is loſt in this motion, the lateral rubbings being prevented thereby, and this being the moſt genuine figure for the largeſt quantity of fluids to move in, raiſing the Water ſooner and with greateſt eaſe.

Explanation of Figure I.

AA the body of the Pump, made of *Oak*, *Elm*, or *Deal*-planks; with a valve at bottom *a a*.

BB the Bucket, in the midſt of which there is a valve *b*, not viſible in the Figure, being concealed by the ſides of the Leather *b b*.

CCC the Iron to raiſe the Bucket.

DD the wood at the bottom of the Bucket containing the Valve.

EE the handle for raiſing the Bucket, to be managed by fewer hands than ordinary Pumps are; which may be altered ſo as to employ a Horſe, or Mill, or other ſuch like way more advantagious than that of this handle, managed by the ſtrength of Men.

FF a ſquare taper-Box, with holes in the ſides, and open at the bottom; into the narrower part of which is incloſed the narrower end of the body of the Pump.

GG an additional Bucket of a larger dimenſion, to be placed in the Iron-work of the Pump about H, when it ſhall be needful to lengthen the Taper of your Pump, and thereby to raiſe the Water more forcibly to a greater height.

I I the Spout of the Pump, to caſt out the water of the ſame breadth with the ſide of the Pump, at the place repreſented by the Figure.

KK the Iron or Wooden-work ſet off, or bent back (if need be,) and placed at the back of this Pump for the eaſier and more capacious motion of the Pump-handle, in which it moves.

It may not be amiſs to mention here, that this Pump, which was uſed at the ſaid New Canal, was eight foot and a half long, and one foot eight inches broad at the top, and about eight inches broad at the bottom where it is inſerted in the Box, and did caſt out eight Gallons at a ſtroke, and twenty one ſtrokes being made in one minute, there was delivered about 169 Gallons a minutes time; whence 'tis eaſie to compute, what quantity is thrown out in an hour.

If it be asked, why the Pump and the Bucket is not of the ſame breadth throughout as high as the Bucket moveth? I anſwer, that it cannot be allowed of any other faſhion than a tapering one, becauſe that the celerity of the motion in the narroweſt part of the Pump would thereby be obſtructed in its ſupplying the delivery of the Water, which is thereby provided for the evacuation anſwering to the bigneſs of the uppermoſt broader part of the Pump.

Note, that this kind of Pump may by the ſame contrivance be made of a Tree bored through with a Taper-bore; and a Basket may be uſed at the bottom of the Pump inſtead of the Box-Colender.

Some Conſiderations of an obſerving perſon in the Country upon Numb. 133. *of theſe Tracts, ſent in a Letter to the Publiſher of* May 2. 1677.

SIR,

YOur Tract of *Numb.* 133. is very pleaſing for the great variety of good Arguments, ſome very curious, ſome very uſeful, all very conſiderable.

1. Your Preface is brief and modeſt. And never were noble Travellers better furniſht with learned and accurate Inſtructions, and with exact and compleat Exemplars, as appears in ſeveral of your Breviates. In the *firſt* Volume you ſuggeſt ſome of the moſt remarkable *Inquiries* for many foreign Countries: You begin with Artificial Inſtruments, *N.* 1. *p.* 31; more particularly for the Sea, *N.* 8. *p.* 140, further explain'd *N.* 24; and with an Inſtrument for drawing any Object in perſpective, *N.* 45. And now Mr. *Moxon*, Mr. *Seller*, Mr. *Green*, Mr. *Morden* and others are abundantly furniſhed with Sea-plots for all Navigations, Projections, Mathematical Books and Mathematical Inſtruments for all occaſions of Travellers by Sea or Land. Neither *Anacharſis*, nor *Democritus*, *Pythagoras*, nor *Apollonius Thya-*

Thyaneus, could boaſt of ſuch furniture for their Philoſophical peregrinations. And, beſides the Learned *Greſhamiſts*, you have many expert Teachers of theſe uſeful Arts. And a Free-School is lately erected by his Majeſties munificence, to inſtruct forty young Scholars in Geometry, Navigation, and other parts of the Mathematicks. Mean while our Univerſities and noble Palaces are, ſome of them, provided of Furnaces and Chymical Expedients; ſome for Aſtronomical Obſervatories, ſome for Conſervatories: To draw ſtill more Philoſophy from them all.

2. The Agreſtic Advertiſements may mind ſome Gardiners, and Nurſery-men, and Country-gentlemen, to do much good for themſelves and for their Country: And may mind Worthy Merchants, to bring us home the beſt Vegetables for Food, Drink, Medicine, or other good uſes; and may excite a more general induſtry, to ſilence all juſt complaints of the want of good employment in *England*.

3. Mr. *Leewenhoecks* Microſcopical Diſcoveries are exceeding curious, and may prompt us to ſuſpect, that our Air is alſo vermiculated *, and perhaps moſt of all in long Calms, long-laſting Eaſtern Winds, or much moiſture in Spring-time, and in ſeaſons of general Infections of Men or Animals. Lord *Bacon* in his *Nat. Hiſtory* makes a Collection of Prognoſticks of Infectious years, ſuch as could be made without ſuch curious Inſtruments. By which perhaps in time we may be premoniſhed of Infections. And if we may be certain of Seaſons of great danger, I think we may be certain of effectual Remedies, by Gods bleſſing: As we find by Experience, that *Fires* and *Smothers* duly order'd, ſo as that the Winds may drive and carry them all over our Orchards and Gardens, do infallibly deſtroy all Caterpillars and other noxious Inſects: And to interrupt the Calms and other annoyances of the Air, we may apply all the helps recommended in *Muffet's Improvement of Health*, *c.* 4. *viz.* by noiſe of Bells, Guns, Drums, Trumpets, Tabrets and other Muſical Inſtruments; by the chearful ſhouts of the people, and by cleanſing all our Towns and Villages by Fire and pure Water, which will be more effectual, if it be done every where at the ſame ſet time, as when the Feſtival Bonefires were in uſe all over the Kingdom.

* *But this Obſerver could hitherto never find this, as he intimates in the ſequel of that Diſcourſe, which perhaps may be publiſhed hereafter.*

4. Signor

4. Signor *Caſſini*'s account of the Satellites of *Saturn* are very remarkable. We hear of no expedients to view the back-parts of *our Moon*; but poſſibly by future improvements of Teleſcopes we may make ſome gueſs of the back parts of ſome of the Moons of *Saturn* or *Jupiter*, as Monſieur *Bullialdus* hath found blind ſides of the Starry Firmament, as we call it.

5. 'Tis well for us, that Mr. *Ray* is an indefatigable perſon. For, this his latter Task requires a mans age to perform it ſo exactly as he hath done: Beſides his other great labours, and what we expect from his help for the *Hiſtory of Animals*.

6. *Aero-chalinos* was very neceſſary after ſo many wonderful diſcoveries of *Air* in general. Much rich Oar is already digg'd out of the Heart and from the bottom of Rocks and Mountains; but we want many hands to melt it down, and to form it into Utenſils. Theſe ſubtile Fluids do encompaſs us in vaſt proportions, and do beſiege us both with ſtrong and ſtormy violence, and with treacherous and irreſiſtible Inſinuations. May the happy Author perſevere, and proſper in compleating the large branch of moſt ſubtile and no leſs uſeful philoſophy.

7. I do not remember, I ever ſaw any thing that might be compared with this laſt philoſophical Account of *Muſick*; nor indeed any thing before, that could ſatisfie my own poor and dull ſcruples. And many of theſe Obſervations do ſeem to me to open a door for great depths, and great variety of Philoſophical information. I was not a little delighted to read in Mr. *Boyle*'s Tract of *Mens ignorance of the Uſefulneſs of Natural Things*, in his Second Tome of the Uſefulneſs of that Philoſophy, p. 14, That *equal wire-ſtrings, made of differing mettals, and having a due Tenſion, will yield ſounds differing as to ſharpneſs, by determinate Muſical Notes or the Diviſions of them, &c.* I do not know, whether this Author, *Merſennus*, or any other, hath examined, How far the proportions of Metalline mixtures, or the nature of other ſonorous bodies, may be indicated by this Muſical Expedient. Many ſuch hints and overtures may be had in this acute, or rather harmonious diſcourſe.

A Demonstration concerning the Motion of Light, *communicated from* Paris, *in the* Journal des Scavans, *and here made English.*

PHilosophers have been labouring for many years to decide by some Experience, whether the action of Light be conveyed in an instance to distant places, or whether it requireth time. M. *Romer* of the *R. Academy* of the Sciences hath devised a way, taken from the Observations of the first Satellit of *Jupiter*, by which he demonstrates, that for the distance of about 3000 leagues, such as is very near the bigness of the Diameter of the Earth, Light needs not one second of time.

Let (in *Fig.* 11.) A be the *Sun*, B *Jupiter*, C the first Satellit of *Jupiter*, which enters into the shadow of *Jupiter*, to come out of it at D; and let EFGHKL be the *Earth* placed at divers distances from *Jupiter*.

Now, suppose the *Earth*, being in L towards the second Quadrature of *Jupiter*, hath seen the first Satellit at the time of its emersion or issuing out of the shadow in D; and that about $42\frac{1}{2}$ hours after, (*vid.* after one revolution of this Satellit,) the *Earth* being in K, do see it returned in D; it is manifest, that if the Light require time to traverse the interval LK, the Satellit will be seen returned later in D, than it would have been if the Earth had remained in L, so that the revolution of this Satellit being thus observed by the Emersions, will be retarded by so much time, as the Light shall have taken in passing from L to K, and that, on the contrary, in the other Quadrature FG, where the *Earth* by approaching goes to meet the Light, the revolutions of the Immersions will appear to be shortned by so much, as those of the Emersions had appeared to be lengthned. And because in $42\frac{1}{2}$ hours, which this Satellit very near takes to make one revolution, the distance between the *Earth* and *Jupiter* in both the Quadratures varies at least 210 Diameters of the *Earth*, it follows, that if for the account of every Diameter of the *Earth* there were required a second of time, the Light would take $3\frac{1}{2}$ minutes for each of the intervals GF, KL; which would cause near half a quarter of an hour between two revolutions of the first Satellit, one observed in FG, and the other in KL, whereas there is not observed any sensible difference.

Yet

Yet doth it not follow hence, that Light demands no time. For, after M. *Romer* had examin'd the thing more nearly, he found, that what was not ſenſible in two revolutions, became very conſiderable in many being taken together, and that, for example, forty revolutions obſerved on the ſide F, might be ſenſibly ſhorter, than forty others obſerved in any place of the Zodiack where *Jupiter* may be met with; and that in proportion of twenty two for the whole interval of H E, which is the double of the interval that is from hence to the Sun.

The neceſſity of this new Equation of the retardment of Light, is eſtabliſhed by all the obſervations that have been made in the *R. Academy*, and in the *Obſervatory*, for the ſpace of eight years, and it hath been lately confirmed by the Emerſion of the firſt Satellit obſerved at *Paris* the *9th* of *November* laſt at 5 a Clock, 35'. 45". at Night, 10 minutes later than it was to be expected, by deducing it from thoſe that had been obſerved in the Month of *Auguſt*, when the *Earth* was much nearer to *Jupiter*: Which M. *Romer* had predicted to the ſaid Academy from the beginning of *September*.

But to remove all doubt, that this inequality is cauſed by the retardment of the Light, he demonſtrates, that it cannot come from any excentricity, or any other cauſe of thoſe that are commonly alledged to explicate the irregularities of the *Moon* and the other Planets; though he be well aware, that the firſt Satellit of *Jupiter* was excentrick, and that, beſides, his revolutions were advanced or retarded according as *Jupiter* did approach to or recede from the Sun, as alſo that the revolutions of the *primum mobile* were unequal; yet ſaith he, theſe three laſt cauſes of inequality do not hinder the firſt from being manifeſt.

A Relation of ſome ſtrange phænomena, *accompanied with miſchievous effects in a Cole-work in* Flint-ſhire; *ſent* March 31. 1677. *to the Reverend and eminently Learned Dr.* Bathurſt, *Dean of* Bath *and* Wells, *by an Ingenious Gentleman, Mr.* Roger Moſlyn, *of the Inner Temple, who, at the ſaid Doctor's requeſt, obtained it from his Fathers Steward, and Overſeer of his Cole-works, who was upon the place when the thing was done; the ſame Mr.* Moſlyn *being alſo aſſured of it from his Father, Sr.* Roger Moſlyn, *Lord of the Mannor, and ſeveral others, who were Eye-witneſſes.*

THe Cole-work at *Moſlyn* in *Flint-ſhire* lies in a large parcel of Wood-land, that from the Countries ſide which lies to the South hath a great fall to the Sea-ſide, which is direct North; The dipping or fall of the ſeveral Rocks or Quarries of Stone that are above the Cole, and conſequently of the Cole lying under them, doth partly croſs the fall of the ground, ſo that the dipping of it falls within a point or leſs of due Eaſt, which is the cauſe, that the Pits that are ſunk at the Sea-ſide in the ſame level with the full Sea-mark, are not ſhort of the depth of the others that are upon the higher ground, above fifteen or ſixteen yards; ſo that they lie ſome ſixty, ſome fifty, and the ebbeſt forty yards under the level of the Sea. This above-mentioned work is upon a Cole of five yards in thickneſs, and hath been begun upon, about ſix or eight and thirty years ago: When it was firſt found, it was extream full of Water, ſo that it could not be wrought down to the bottom of the Cole, but a Witchet or Cave was driven out in the middle of it upon a level for gaining of room to work, and drawing down the Spring of water that lies in the Cole to the Eye of the pit; in driving of which Witchet, after they had gone a conſiderable way under ground, and were ſcanted of wind, the Fire-damp did by little and little begin to breed, and to appear in creviſſes and ſlits of the Cole, where water had lain before the opening of the Cole with a ſmall blewiſh flame working and moving continually, but not out of its firſt ſeal, unleſs the Workmen came and held their Candle to it, and then, being weak the blaze of the Candle would drive it, with a ſudden fizz, away to another Creveſs, where it would ſoon after appear blazing and moving as formerly. This was the firſt knowledge of it in this work, which the Workmen made but a ſport of, and ſo partly neglected it till it

had gotten some strength, and then upon a morning the first Collier that went down, going forwards in the Witchet with his Candle in hand, the damp presently darted out violently at his Candle, that it struck the man clear down, singed all his hair and clothes, and disabled him for working a while after; some other small warnings it gave them, insomuch that they resolved to employ a man of purpose, that was more resolute than the rest, to go down a while before them every Morning to chase it from place to place, and so to weaken it. His usual manner was to put on the worst raggs he had, and to wet them well in water, and assoon as he came within the danger of it, then he fell grovelling down on his belly and went so forward, holding in one hand a long wand or pole, at the end whereof he tied Candles burning, and reached them by degrees towards it, then the Damp would flie at them, and if it miss'd of putting them out, it would quench it self with a blast, and leave an ill-sented smoke behind it: Thus they dealt with it till they had wrought the Cole down to the bottom, and the water following and not remaining as before in the body of it among sulphureous and brassie Mettal that is in some veins of the Cole, the Fire-damp was not seen or heard of till the latter end of the year 1675, which happened as followeth.

After long working of this five yards Cole, and trial made of it in several places, it was found upon the rising grounds (where the signs of the Cole, and the Cole it self came near the day) that there lay another Roach of Cole at a certain depth under it, which being sunk to, and tried upon some out-skirts of the main work, it was found at fourteen yards depth, and wrought, proving to be three yards and a half thick; and a profitable Cole, but something more sulphureous than the other, and to reach under all the former work. This discovery of so promising a work encouraged us to sink some of the ebbest Pits, that we had formerly used on the five yards Cole, down to the lowest Roach, and accordingly we began in one that was about thirty two yards deep, which we went down with perpendicularly from the first shaft, and sunk down twenty yards before we came to the said Roach, in regard it was at the Sea-side, and upon the lowest of the dipp (where the Rocks successively thicken as they fall) having prick'd it, and being sure of it, we let it rest, having had for a considerable time, as we sunk the lower part of it, many

appear-

appearances of the Fire-damp in watery creviſſes of the Rocks we ſunk through, flaſhing and darting from ſide to ſide of the Pit, and ſhewing Rainbow-colour-like on the ſurface of the water in the bottom; but upon drawing-up of the water with Buckets, which ſtirr'd the Air in the Pit, it would leave burning, till the Colliers at work with their breath and ſweat and the ſmoke of their Candles thickned the Air in the Pit, then it would appear again, they lighting their Candles in it ſometimes when they went out; and ſo in this Pit it did no further harm.

Having brought our firſt Pit thus forward, we were to conſider of another to follow it, both for free paſſage of Air, as for furtherance of the work, and being deſirous to get it in ſome forwardneſs before Summer, (when the heat of the weather at ſome time, and the cloſeneſs of the Air in foggy weather at other, occaſions the Smothering-damp) it was reſolv'd, for expeditions ſake and ſaving of ſome charges, to ſink a Pit within the hollows or deads of the upper work, at 16 or 17 yards diſtance from the firſt Pit; this we proceeded in till we came 6 or 7 yards deep, then the Fire-damp began to appear as formerly, accompanying the Workmen ſtill as they ſunk, and they uſing the ſame means as afore, ſometimes blowing it out with a blaſt of their mouth, at other times with their Candles, or letting it blaze without interruption. As we ſunk down and the Damp got ſtill more and more ſtrength, we found that our want of Air perpendicularly from the day was the great cauſe and nouriſher of this Damp; for the Air that followed down into this Pit, came down at the firſt ſunk Pit at the forementioned diſtance, after it had been diſperſed over all the old hollows and deads of the former work, that were fill'd up with noyſom Vapors, thick ſmothering Fogs, and in ſome places with the Smothering-damp it ſelf: Nevertheleſs we held on ſinking, till we came down to 15 yards, plying the work night and day (except Sundays and Holydays) upon which intermiſſion the Pit being left alone for 48 hours and more, and the Damp gaining great ſtrength in the interim, by that time the Workmen went down, they could ſee it flaſhing and ſhooting from ſide to ſide like Sword-blades croſs one another, that none durſt adventure to go down into the Pit: Upon this they took a Pole and bound Candles ſeveral times to the end of it, which they no ſooner ſet over the Eye of the pit, but the Damp would flie up with a long ſharp flame and put out the Can-

dles, leaving a foul ſmoke each time behind it. Findithat things would not allay it, they adventured to bind ſome Candles at a hook hanging at the Ropes end that was uſed up and down in the Pit; when they had lower'd down theſe a little way into the ſhaft of the Pit, up comes the Damp in a full body, blows out the Candles, diſperſeth it ſelf about the Eye of the Pit, and burneth a great part of the mens hair, beards and clothes, and ſtrikes down one of them, in the mean time making a noiſe like the lowing or roaring of a Bull, but lowder, and in the end leaving a ſmoke and ſmell behind it worſe than that of a Carrion. Upon this diſcouragement theſe Men came up, and made no further trial; after this the Water that came from it being drawn up at the other Pit was found to be blood-warm, if not warmer, and the Creviſſes of the Rocks where the Damp kept, were all about fire-red *Candlemas* day following. In this juncture there was a ceſſation of work for three days, and then the Steward, thinking to fetch a compaſs about from the eye of the Pit that came from the day, and to bring wind by a ſecure way along with him, that if it burſt again it might be done without danger of mens lives, went down and took two men along with him, which ſerv'd his turn for this purpoſe; he was no ſooner down, but the reſt of the Workmen that had wrought there, diſdaining to be left behind in ſuch a time of danger, haſted down after them, and one of them more undiſcreet than the reſt went headlong with his Candle over the Eye of the damp-Pit, at which the Damp immediately catched and flew to and fro over all the hollows of the work, with a great wind and a continual fire, and as it went, keeping a mighty great roaring noiſe on all ſides. The Men at firſt appearance of it had moſt of them fallen on their faces, and hid themſelves as well as they could in the looſe fleck or ſmall Cole, and under the ſhelter of poſts; yet nevertheleſs the Damp returning out of the Hollows, and drawing towards the Eye of the Pit, it came up with incredible force, the Wind and Fire tore moſt of their clothes off their backs, and ſinged what was left, burning their hair, faces and hands, the blaſt falling ſo ſharp on their skin, as if they had been whipt with Rods; ſome that had leaſt ſhelter, were carried 15 or 16 yards from their firſt ſtation and beaten againſt the roof of the Coal, and ſides of the poſts, and lay afterwards a good while ſenſeleſs, ſo that it was long before they could hear or find one another: As

it

it drew up to the Day-pit, it caught one of the men along with it that was next the Eye, and up it comes with such a terrible crack, not unlike, but more shrill than a Canon, that it was heard fifteen miles off along with the Wind, and such a pillar of Smoke as darkened all the sky over head for a good while: The brow of the Hill above the Pit was 18 yards high, and on it grew Trees 14 or 15 yards long, yet the mans Body and other things from the Pit were seen above the tops of the highest Trees at least a hundred yards. On this Pit stood a Horse-engin of substantial Timber, and strong Iron-work, on which lay a trunk or barrel for winding the Rope up and down of above a thousand pound weight, it was then in motion, one Bucket going down and the other coming up full of Water. This Trunk was fastned to the frame with locks and bolts of Iron, yet it was thrown up and carried a good way from the Pit, and pieces of it, though bound with Iron-hoops and strong Nails, blown into the Woods about; so likewise were the two Buckets, and the ends of the Rope after the Buckets were blown from them stood a while upright in the Air like pikes, and then came leisurely drilling down: The whole frame of the Engin was stirr'd and moved out of its place, and those Mens Clothes, Caps and Hats that escaped were afterwards found shattered to pieces, and thrown amongst the Woods a great way from the Pit. This happened the third of *February* 1675, being a Season when other Damps are scarce felt or heard of.

Mr. Leewenhoecks *Letter written to the Publisher from* Delff *the* 14th *of* May 1677, *concerning the Observations by him made of the Carneous Fibres of a* Muscle, *and the* Cortical *and Medullar part of the* Brain; *as also of* Moxa *and* Cotton.

SIR,

YOurs of the 22*th* of *February* mentions, that some of your Friends did wish, I would with all possible exactness observe the *Carneous* Fibres of a *Muscle*, and also the *Cortical* and *Medullar* part of the *Brain*.

I acquainted you formerly in my Letter of the first of *June* 1674, that those *Carneous* fibres of *Muscles* did consist of very small globuls; yet for the further satisfaction of your Friends, I have laid aside all my former Observations, to make quite new ones.

Among other, I took the flesh of a *Cow*; this I cut asunder with

with a sharp Knife, and using a Microscope I sever'd before my eyes the membran from it; whereby I plainly saw that fine membran or film, in which these Carneous fibres lie interwoven, and of which I speak in the above-mention'd Letter of the first of *June* 1674; where I say, that those Membrans are made up of so many filaments or threds, as if with our naked Eye we saw the *omentum* of an Animal. Observing these Membrans more narrowly, I saw, that they do wholly and only consist of small threds running through one another; of which some, to my eye, appear'd to be 10, 20, and some 50 times thinner than a hair.

Having taken off the said Membrans from the said Carneous filaments, I saw very clearly these Carneous threds, which in this piece of flesh were as thick as a hair on ones hand. Where they lay somewhat thick upon one another, they appear'd red; but the thinner they were spread, the clearer they shew'd.

I have used several methods of observing, to see the particles of these Carneous filaments, and have always found, that they are composed of such parts, to which I can give no other figure than globular. Moreover, I have divided before my Eye into many small parts very small pieces of these Carneous filaments, which pieces were several times smaller than a grain of Sand; and I have observed besides, that, when the flesh is fresh and moist, and the globuls thereof are pressed or rubbed, they dissolve and run together, as if you saw an oily or thick wateriſh matter.

These globuls, of which I say that the Carneous filaments do consist, are so small, that, if I may judge by my sight, I must needs say, that ten hundred thousand of them would not make one grain of gravel-Sand.

And having formerly written to you, that the particles, which do constitute flesh, fat, bones, hair, &c. (which I call globuls) are not perfect globuls, but only come near such; I shall now repeat something of that matter: I desire you to consider only, that a great number of Sheeps-bladders, fill'd with water, and held in the Air, and every where surrounded by the same, are round, but if you throw them together into a Tun, they will lose their roundess, and fall close together, whereby each bladder will come to have its peculiar figure, they being very flexible; though the uppermost in the tun, as far as they are encompassed

by

by the Air, will retain their globosity. Thus it is with the globuls of the flesh, which are very soft, as far as they are more or less surrounded by the Air.

Next, I have examined that membran of the Brain, which is call'd *pia mater*, and found, that this membran is permeated by very many little veins, besides those which with the naked eye we see upon the brain, especially having first separated the thin membran from the brain, under which I have seen small veins of an admirable and incredible fineness, and, as far as I was able to discern, they consist of exceeding thin filaments.

I have further observed, that the above-mention'd great number of veins, which run through the thin membran, disseminate their ramifications thorow the brain, after the manner as vines lying upon the earth shoot roots into the ground; imagining the Brain to be like the Earth, & the Veins like the Roots in the Earth.

Proceeding to the parts of the Brain it self, I must still say of them, especially where they lie any thing thick upon one another, that they consist of no other parts but globuls; but where the Brain lay spred very thin, cut thorough with a Knife, as if they had been separated from one another, there they appeared like a very clear matter, as if it had been Oyl. Having view'd this matter, I imagined, it was thus caused by the knife, whereby the globuls of the brain had been broken: But continuing my Observations, not only of the Brains of beasts, but also of fishes, and particularly of a Cod-fish, and representing it very plainly to my eye, I saw, that the said oleaginous matter had not been caused by the knife, but that indeed it was a matter by it self, wherein the aforesaid globuls lay. I saw moreover, but most plainly in the brain of a Cod-fish, that the said oleous matter did indeed consist also of yet much smaller globuls, than the other.

The former greater globuls of the brain, are, by my estimation, about the bigness of those, which I formerly said the Blood was made up of (which render the blood red.) These greater globuls, which compose the Brain, are very irregular in respect of what those of the Blood are: Whereof I conceive the cause to be this, that the globuls of the Brain lie close to one another, or to the Vessels, and being very soft do not separate though they be shaken; whereas on the contrary, the sanguine globuls are moved in a more fluid matter, and therefore, having elbow-room, keep their roundness.

I remember, that having heretofore obſerv'd the Brain of a *Duck*, I then judged, that they were cauſed only by the cloſe union, which the globuls (of which I then thought the whole Brain was made up) had to one another, and which did change into threds by a little ſtretching. But continuing my Obſervations for almoſt a whole month together, I have ſeen plainly the very great number of exceeding ſmall veins running through the Brain; of which I could not at firſt aſſure my ſelf in the Brains of Beaſts, that they were indeed Veins, becauſe they are difficult to diſcern: But coming to obſerve the Brains of *Cod fiſh*, I very plainly ſaw thoſe many veſſels or veins, which were very clear, and withal very many throughout, diſſeminating themſelves by their ſmall branchings, and being 15 or 20 times finer than a ſingle thred of a Silkworm. Theſe ſmall veſſels or veins I have ſeen in great nnmbers in no greater quantity of the brain than might equal a grain of Sand: Beſides, I ſaw veſſels filled with blood or appearing red; as alſo veſſels that had the thickneſs of a ſingle thred of a Silk-worm, accompanied with great clearneſs.

Purſuing theſe my Obſervations about the Brains of Beaſts, I was able very plainly to repreſent to my ſelf the veſſels above diſcourſed of; and I could not without great admiration behold them, partly by reaſon of their great number, partly of their extraordinary ſublety; ſo that I muſt needs ſay, that if one blood-globul, I mean of thoſe that make the blood red, were divided into eight parts, and were of a ſtiff ſubſtance, it could not paſs any of theſe ſmall veſſels. And the oftner I repeated my obſervations, the plainer I could ſee thoſe manifold little veſſels with their ramuſcles, which were all very feeble, and by the leaſt touch broke aſunder.

Among the ſaid globuls, of which in part the Brain conſiſts, I have ſeen Blood-globuls, which may very plainly be diſcern'd from the Brain-globuls, eſpecially by the perfect roundneſs which the blood globuls had. Theſe blood-globuls, I imagined, came out of the ſanguineous veſſels, which run through the Brain, and had been cut in pieces by the Knife.

Between the *Cortical* and *Medullar* part of the Brain I can ſee little or no difference, eſpecially when I repreſent them before me very thin: Only this I noted, that the little veins or veſſels which ran through the *Cortex*, were of a dark and brown colour.

colour, whereas thoſe in the *Medulla* were clearer and more tranſparent.

I have ſeen in the Brain, and moſt in the Cortical part, ſuch Small ſanguineous veſſels being red (which came out of bigger ones) that I cannot comprehend, how the globuls could paſs through them; and, (what is more,) when you ſee the Blood-globuls ſingle, they have little or no colour, whereas on the contrary the blood in theſe ſmall veins was yet red: Yea, the red colour penetrated through the veins, and coloured the neighbouring parts of the brain red. But reflecting on my former obſervations about *Lice*, I there ſaw divers times, that when I made a Louſe hungry, and then ſet her on to ſuck blood, ſhe could not diſpoſe of, nor digeſt, all the blood; whence it came to paſs, that the blood-globuls, which rendred it red, came to diſſolve in the fluid matter, and ſo changed the blood into a more fluid matter; and this blood came to diffuſe it ſelf through the whole body of the Louſe, and through the very feet and horns, and to colour them red. The cauſe, why the blood was not conſumed in the Louſe, I imagined to be, becauſe the guts, or ſmall veins in the Louſe, had been for want of food dried up, whence the ſame was hindred from its due motion, nor could be duly conveyed through the body. Yet this change of blood (I very well remember) hath at other times been obſerved by me, when the blood had ſtood a while in a Glaſs. And thus it may be or become red in the ſmall veins of the Brain, though they be ſo ſlender, that no globuls, keeping their roundneſs, can paſs through them.

I have alſo obſerv'd the *Spinal marrow* of a Calf, Pullet, Sheep, and Cod-fiſh; which I have found to conſiſt of no other parts than thoſe of the Brain; yet with this difference, that, beſides the related globuls in the Brain, there lay in the Spinal marrow a great number of ſhining oleaginous globuls, of divers bigneſſes, ſome of them 50 times bigger than others; and thoſe alſo very ſoft and fluid. Theſe ſpinal marrows were alſo furniſhed with exceeding thin and manifold ſmall veins or veſſels; and beſides theſe very ſmall veins, there ran up and down along theſe ſpinal marrows brown filaments, of the thickneſs of the hair of ones head, and thinner. Theſe being ſeen by me, I imagined firſt, whether ſuch filament might not be a vein; but having further with great attention inquired into it, I perceived, that each fi-

lament was not one single vessel by it self, but that each of them consisted of divers very small threds or vessels, lying by one another, between which threds there lay very clear vessels of the fineness of a single Silk-worm-thred. Here I had thoughts, whether these vessels might not be those, that conveyed the animal spirits through the Spinal marrow.

A while since, being at the house of Monsieur *Constantin Huygens de Zulichem*, he did me the favour to shew me some of that *Moxa*, which by burning it upon any gouty part removeth the Gout. Of this stuff I took some along with me, and (out of curiosity only) burnt some of it upon the back of my hand according to the prescript of the Book published concerning it, the better to know if there were any peculiarity in its burning. Which done I found, that upon the skin where the burning was made, there lay a yellow oily matter, which I thought at first had been caused only by the burning of the skin. This burning I gave over, not by reason of the pain, but of its slow healing; and if I had not found more trouble in it, than in the cut of my hand made with a Knife, (which I am wont to sow up, and then count it healed) I should have repeated the burning several times. I have more than once examined this *Moxa* by my Microscope, and do not find it to be such a curious preparation of an excellent dryed herb; but that 'tis only some lanuginous expiration or protrusion of a fruit, such as is the *lanugo* seen upon a Peach, Quince, or the like; and I was of opinion, that I might have gather'd very near the like substance from some herbs; but that I have hitherto failed of.

This *Moxa* agrees in shape with Cotton: For, as there is no other difference between *Hair* and *Wool*, than that Hair is courser and longer than Wool, both being made up of globuls, and they being clear about the rounder end; so little difference is there between the *Moxa* and *Cotton*, for they have both two flat sides. Such a shape hath also the roughness, that is found lying within against the red bark of a Chestnut; only with this difference, that that of *Moxa* is much thinner than that of *Cotton*, and that of *Cotton* thinner than of the *Chesnut*. I have put some of the *Moxa* (because I would not be troubled with the burning of it upon my skin) on fine post-paper, and some *Cotton* likewise, after I had somewhat cut it asunder with Sciffers, that so, by its being shorter, the fire might the better pass from one part to

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the other. The burnings caused on the paper by both, were very near alike; and I concluded thereupon, that if the burning had any effect in the gout, it proceeded not from any peculiar quality in the *Moxa*, but only from the burning it self, and that if the burning were made with *Cotton*, it would produce as good effects as if made with *Moxa*.

I have taken very near the same quantity of *Moxa*, *Cotton*, and the matter which lies within a *Chesnut* against the red outer skin thereof, and burnt them together one by the other, and I have seen, that they all three, after burning, left behind them an oleous matter; but the *Moxa* most: Which may proceed from hence, that though there seemed to be the same quantity of all, yet the *Moxa* held more, it being finer than *Cotton*, and therefore lying closer together, and consequently yielding more oyl. Whence it appears, that Mr. *Busschoff* had not so good reason to extol the *Moxa* and its preparation above *Cotton* or other the like substances.

Having consider'd the saying of Chirurgions, that *Cotton* is fiery and malignant if any wound be dressed therewith; I have found, that that fierinesse or malignity consists in this, that *Cotton* hath two flat sides, (as was said above) and consequently every part of it hath two sharp sides, which being thinner than globuls, that make up the Carneous filaments, and being also stiffer than the globular flesh, it comes to pass, that *Cotton* being laid upon a wound, not only the globuls of the yet sound flesh are annoyed by the sharp sides of it, but also the new matter which is conveyed to make new flesh, and is yet softer than the flesh already made, is the more easily cut asunder and dissolved; whereas on the contrary, linnen-rags, having roundish parts and many of them lying firm together, and so making up a greater body, are not capable to wound the globular parts of the flesh.

The Description of a Celestial Globe, artificially made shewing the Apparent Motions, from East to West, and from West to East, of the Sun, Moon, and Fixed Stars: Made by Monsieur Didier L'Alleman, *Master Watchmaker at* Paris, *and communicated to the Publisher in French, and here by the same made English.*

THis Globe hath been made conform to the Observations of the most famous Astronomers of this Age, and directed by Monsieur *Antonine Agarrat*, Professor of the Mathematicks at *Paris*.

The bigneſs of it is only of four Inches diameter. The body of the Globe of burniſh't Steel, where all the figures of the Conſtellations are deſigned in Silver-colour, but the Stars themſelves of all Magnitudes are put on in emboſſed Gold.

This Globe moves from Eaſt to Weſt in 24 hours; and you may there ſee the Sun exactly riſe and ſet as in the great World, together with the Moon, as alſo the Stars of the Conſtellations; likewiſe how the Sun of this Globe comes to his Meridian, with an admirable regularity, conform to the *Primum mobile*.

Beſides this, you may there ſee, that every day the Sun ſenſibly paſſeth one degree from Weſt to Eaſt, which is its own proper motion finiſhed by him in a year, and thereby deſcribing to us the Inequality of Days and Nights.

Moreover, you may there obſerve every day the *Mean* motion of the Moon from Weſt to Eaſt, how ſhe increaſeth according as ſhe removeth from the Sun, ſo that it ſhews viſibly the firſt quarter of the Moon, the end of the ſecond quarter which is the Full; then the third quarter which is the laſt quadrature, and laſtly her Conjunction with the Sun. And thus ſhe is ſeen to finiſh every month her Synodical Courſe; and by her diurnal motion of 24 hours ſhe ſhews the Flux and Reflux of the Sea, or high and low water.

The Meridian ſerveth for a Needle to ſhew the Hours which are marked upon the Zodiack, where the Sun marcheth regularly, which hath two main rays, one whereof goeth directly Northward, the other South-ward.

That of the North marks the way or degree, which the Sun maketh from Weſt to Eaſt upon the Signs of the Zodiack, and upon a Circle of Silver, where the 360 Degrees of the Circle are marked. The other ray, of the South, marks upon another Circle of Silver the days of the Month, where the 365 days are noted.

This Globe may generally ſerve for the whole World, ſeeing you may put it to all the Elevations of the Pole.

The Circles of the Longitude of the Stars, which ſeparate the Signs, and which come from the Poles of the Zodiack, are marked by gold-wires; as alſo the Equator, the Tropicks, and the Polar Circles.

There is but one great Spring, the *primum mobile*, which puts all the reſt in motion. It is wound up by the Antarctique Pole, and you may wind it up to the right or left hand, without wronging

wronging any contrary motion. And by the Arctique Pole, you may advance and retard this movement, if you ſhould find any inequality, without altering at all the great Spring.

So far the Deſcription of this artificial Globe; of which we hope we ſhall very ſhortly know the price.

A Deſcription of the Diamond-mines, as it was preſented by the Right Honourable, the Earl Marſhal of England, *to the* R. Society.

THe parts of the World known to contain *Diamonds*, are the Iſland *Borneo*, and the Continent of *India extra & intra Gangem: Pegu* is likewiſe reported to have ſeveral; but the King not potent, his Country being but thinly inhabited, contents himſelf with his Mines of *Rubies*, *Saphires*, *Topaſſes*, *Emeralds*, *Gold*, *Silver*, *Braſs*, *Tinn* and *Lead*, and ſeveral other Commodities his Country affords, in great plenty, rather than to ſuffer new enquiries to be made, leſt the diſcovery of ſuch an additional Treaſure ſhould invite ſome of his Neighbours, more potent, to invade him. But leaving the deſcription of other places to thoſe that know them better, I ſhall only keep my ſelf to the Coaſt of *Coromandel*, with which I am acquainted, and having viſited ſeveral of its Mines, am able to ſay ſomething thereof Experimentally.

The Diamond-Mines in theſe parts are generally adjacent to Rocky-hills, or Mountains, whereof begins a great Ledge or Range near *Cape Comorin*, extending in breadth about 50 *Engliſh* miles, ſome conjoyning, others ſcatter'd: and running thence in length quite through *Bengala*. In, among, and near theſe Hills, in ſeveral places, are known to be (as its believed moſt of them have) Mines; many of them are poſſeſſed by petty Princes, or *Rajaes*, of the *Hundues*; ſome driven thither for ſhelter by the *Mores*, who have taken the greateſt part of their Country from them; others never overcome, as the *Rajaes*, on the Hills in and near *Bengala*, who admit of little or no Commerce with their Neighbours or paſſage through their Country, which (being barren, in few places affording good water, the ways craggy and very toylſom, eſpecially to an Army) the *Moors* covet not, but let them enjoy it peacably; yet to prevent danger, they forbid digging (as the King of *Pegu* does) or dig ſome few Mines only very privately, ſo that a great part of the Mines are unſearcht and concealed. But the Kingdoms of *Golconda* and *Viſiapore* contain

contain in them ſcope enough of ground, known to have Mines ſufficient to furniſh all the World plentifully with Diamonds; but their Kings permit digging only in ſome places appointed, leſt, as it is imagined, they ſhould become too common; and withal for fear of tempting the threatning greatneſs of *Aurengzebe*; forbidding alſo thoſe places that afford the largeſt Stones, or elſe keeping workmen in them for their own private uſes: So that but a very ſmall quantity (in compariſon of what might be) and thoſe only of ordinary ſize, are found.

In the Kingdom of *Golconda* (as near as I can gather from the beſt acquainted) are 23 Mines now employed, or that have been ſo lately, viz. *Quolure*, *Codawillicul*, *Malabar*, *Buttephalem*, *Ramiah*, *Gurem*, *Muttampellee*, *Currure*, *Ganjeeconeta*, *Luttawaar*, *Jonagerree*, *Pirai*, *Dugullee*, *Purwillee*, *Anuntapellee*, *Girregeta*, *Maarmood*, *Wazzergerree*, *Munnemurg*, *Langumboot*, *Whootoor*, *Muddemurg*, and *Melwillee* or the New Mine.

Quolure was the firſt Mine made uſe of in this Kingdom. The Earth is ſomething yellowiſh, not unlike the colour of our Gravel dried; but whiter in ſome places where it abounds with ſmooth pebbles, much like ſome of thoſe that come out of our Gravel-pits in *England*. They uſe to find great quantities in the Vein, if it may properly be ſo called, the Diamonds not lying in continued Cluſters as ſome imagine, but frequently ſo very ſcattering, that ſometimes in the ſpace of $\frac{1}{4}$ of an Acre of ground, digged between two or three fathoms deep, there hath been nothing found; eſpecially in the Mines that afford great Stones, lying near the ſuperficies of the Earth, and about three fathoms deep; deeper they could not dig for water; it being in a Vale near a River. In other places the Earth is mixt with rugged Stones, where they ſeldom mine deeper, though in higher ground, before the colour of the Earth alters, and the Vein ceaſes; which they give a gueſs at by the ſmall Stones they find in the Earth, the principal guide they have in the diſcovery of the Mines.

The Diamonds found in theſe Mines are generally well-ſhaped, many of them pointed, and of a good lively white water; but it alſo produces ſome *yellow* ones, ſome *brown*, and of other colours. They are of ordinary ſizes, from about ſix in a *Mangelin* * (of which they find but few) to five or ſix *Mangelins*, each; ſome of 10, 15, 20 they find but rarely. They have frequently

* *A* Mangelin *is four grains in weight, ſaith* Linſchoten.

frequently a bright and transparent skin, inclining to a greenish colour, though the heart of the Stone be purely white; but the veins of these Mines are almost worn out.

The Mines of *Codawillikul*, *Malabar*, and *Buttepallem* consist of a reddish Earth, inclining to an orange-colour (with which it stains the clothes of the Labourers that work in it) they dig about 4 fathom deep. They afford Stones generally of an excellent water and crystalline skin; smaller sizes than those of *Quolure*, *Ramiah*, *Gurem*, and *Muttampellee*; have a yellowish Earth, like *Quolure*; their Stones like those of the two former Mines, but mixt with many of a blew water. These five Mines being under the same Government with *Melwillee*, where the Governour resides; He (to draw the Adventurers and Merchants near him, that he may be better informed of the actions and advantages, and know the better how to fleece them, the general practice of Governours in these parts;) has very lately forbid their use; and commanded all to repair to his Residence, which they must obey, or flie into another Government.

The next Mine in our way is *Currure*, the most famous of them all and most ancient. It has been under subjection of the King of *Golconda*; but about 25 years, taken, with the Country of *Karnaticum*, from the *Hendue-Rajues*, about that time, by the *Nabob*, *Meer*, *Jumla*. In it have been found Diamonds of a *seize* weight, which is about 9 ounces *Troy* or 81 ½ *Pago's* weight. It is only employed by the King for his own private use: The Diamonds that are found in it, are very well spred, large stones (it yields few or none small,) they have generally a bright skin, which inclines to a pale greenish colour, but within are purely white. The Soyl is reddish as many of the others.

About sixty or seventy years ago, when it was under the Government of the *Hundues*, and several persons permitted to adventure in digging, a *Portugeez* Gentleman went thither from *Goa*, and having spent in Mining a great sum of mony to the amounts of 100000 *Pago's*, as 'tis reported, and converted every thing he brought with him, that would fetch any mony, even to what wearing clothes he could spare, while the Miners were at work for the last days expence, he had prepared a cup of Poyson, resolving, if that night he found nothing, to drink his last with the conclusion of his mony; but in the Evening the Workmen brought him a very fair spread Stone of 20 *Pago's* weight,

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in commemoration whereof he cauſed a great Stone to be erected in the place, with an Inſcription engraven on it, in the *Hundues* or *Tellinga* Tongue, to the following effect, which remains to be ſeen to this day;

Your Wife and Children ſell, ſell what you have,
Spare not your Clothes, nay, make your ſelf a Slave;
But money get, then to CURRURE *make haſt;*
There ſearch the Mines, a prize you'l find at laſt.

After which he immediately returned with his Stone to *Goa.*

Not far from *Currure* are the Mines of *Lattawaar* and *Ganjeeconta,* which are in the ſame Soyl as *Currure,* and afford Stones not unlike: But *Lattawaar* hath many repreſenting the great end of a Razor-blade, thin on one ſide and thick on the other, very white and of an excellent water; but the beſt of the Mine is worn out, and *Ganjeeconta* employed only to the Kings private uſe.

Jonagerre, Pirai, Dugulle, Purwillee and *Anuntapellee,* conſiſt alſo of Red-earth, are now employed, and afford many large Stones; part of them of a greeniſh water; but the moſt abſolute Mines are of *Wazzergerre* and *Munnemurg,* (the other rather repreſenting Pits than Mines;) for there they ſink through high Rocks till they go ſo far below their baſis, that they can go no further for water, in ſome places 40 or 50 fathom deep. The ſuperficies of the Rocks conſiſt of hard, firm, white ſtone, into which they cut a Pit like a Well, of about 4 or 5, in ſome places 6 foot deep, before they come to a cruſt of a Mineral Stone, like the Mineral of Iron; when they fill the Hole with Wood and keep as hot a fire as they can there for 2 or 3 days, till they think it ſufficiently heated; then they pour-in water till they have quencht it, which alſo ſlakes and mollifies both Stone and Mineral; both being cold, they dig again, take out all the crumbled ſtuff and dig up what they can beſides, before they heat it anew; the cruſt ſeldom is thicker than 3 or 4 foot, which ceaſing, they come to a vein of Earth, that uſually runs under the Rock 2 or 3 furlongs; ſometimes much further: This they dig all out and ſearch, and if their firſt attempt prove ſucceſsful, they go to work again (digging after the ſame manner) as deep as they can, till they come to water; for the drawing whereof, wanting the help of Engins, known in *Europe*, they can go no deeper, although the Vein lie lower; all lumps of the Mineral they break

break in pieces, and frequently find Diamonds encloſed in them. To work on theſe Mines is very expenſive, but the advantage is commonly anſwerable; yet in reſpect of the certain diſburſe, that muſt be before any thing be found, they are not ſo much frequented as others, where they may try their fortunes with a ſmaller ſtock. The Earth they dig out is red: Many large Stones are found here; the ſmalleſt about 6 in a *mangelleen*. They are mixt waters, but the greateſt part good, only of ill-favoured ſhapes, many cragged pieces of ſtones, ſome as if they had been parts of very great ones, others with pieces broken off them; yet I never heard of any that found two ſeeming fellows, although they do thoſe that look as if they had been newly broken.

In *Langumboot* they dig as they do at *Wazzergerree* and *Munnemurg*; the Rock is not altogether ſo ſolid, but the Earth and Stones it produces much alike.

Wootoor ſhould have been placed next to *Currure*, it lying near it, and affording Stones of a like magnitude, ſhapes and waters; 'tis employed only to the Kings uſe: And ſingular, in that its Diamonds are found in black Earth.

Muddemurg far exceeds all the reſt for Diamonds of a delicate ſhape, water, and bright tranſparent skin, proud, as it were, in diſcovering their inward beauties, with which no other Mine can compare; yet it has alſo ſtore of Veiny ones, but thoſe likewiſe of ſo curious ſhape and water, that its difficult to diſcover them from the good, eſpecially the ſmall ones. It produces Stones of divers magnitudes, from 10 and 12 in a *mangelleen*, to 6 or 7 *magelleens* each, and beſides, ſome great ones. The Earth is red, but it's ſeated in the Woods, and the water ſo bad, that to all (except the people bred there) it preſently occaſions Feavers & deſtroys abundance, inſomuch that moſt of the Adventurers have forſaken it; notwithſtanding which it hath been more profitable than any of the reſt, the Vein frequently lying near the ſuperficies of the Earth, ſeldom running deep, and is better furniſht than any other yet diſcover'd. The River *Kiſhna*, of excellent waters, is but 9 miles diſtant; but the Miners or Merchants are either poor that they cannot, or elſe over awed by the Governour, pretend to be and dare not be at the charges of fetching their water from thence. Divers are of the opinion, that, beſides the Water, the Town lying in a bottom, environ'd with Hills and Moraſs adjoyning, the Air may be infected, and contribute to its unhealthfulneſs.

Melwillee or the *New Mine*, so called, because it was but lately found out (or at least permitted to be made use of) in the year 1670; it had then a year employed the Miners, but it was forbidden and lay unoccupied till 1673, when complaint being made at *Quoleur*, that the Vein was worn out, the King again licensed its settlement. The Earth they mine in, is very red, and many of the Stones found there have of it sticking to them, as if it had clung there while they were of a soft glutinous substance and had not attained their hardness, maintaining its colour on its skin (seeming to be roughned with it) that it cannot be fetcht out by grinding on a rough Stone with Sand, which they make use of to clean them. The Stones are generally well-shaped, their size from 5 or 6 in a *mangelleen* to those of 14 or 15 each, and some bigger; but greatest quantities of the middle sorts: Most of them have a thick dull skin, incline to a yellowish water, not altogether so strong & lively as of the other Mines; very few of them of a crystallin water & skin. They are reported to be apt to flaw in splitting, which occasions these people to esteem them something softer than the product of many of the other Mines: several that flatter by their seeming whiteness when rough, discover their deceitfulness having past the Mill, and too often a yellowish tincture, to the disappointment and loss of them that have cut them; but what they want in goodness, is in part supplied by the plenty they find, which, together with their properties, make them the cheaper. This being what I have gathered, both by experience of several of the places I have seen, and the best Informations I could meet with, of the Mines in this Kingdom; I shall now proceed to those in *Visiapore*.

Visiapore is known to contain Mines enclosing Stones as large and good as those of *Golconda*; but the King, for reasons already given, makes use but of the meanest: whereby, as *Golconda* is famous for the largeness of those it affords, *Visiapore* is noted for the smallest; whose Mines, though they seldom or never render an Adventurer a fortune or estate at once, as sometimes those of *Golconda* do, by a great Stone or several found together; yet they are more populous and better employed, the small Stones lying thicker in the earth, so that the generality are gainers, and few but they get their expence; whereas those of *Golconda* dig away a considerable Estate and find nothing, others not their charges, and where one is a gainer, divers lose.

There

There are 15 Mines employed in the Kingdom of *Visiapore*, viz *Ramulconeta*, *Banugunnapellee*, *Pendekull*, *Moodawarum*, *Cummerwillee*, *Paulkull*, *Workull*, *Lungeepoleur*, *Pootloor*, *Punchelingull*, *Shingarrampent*, *Tondarpaar*, *Gundepellee*, *Donee* and *Gazerpellee*.

In *Ramulconeta* Mines in red Earth, about 15 or 16 foot deep, they seldom find a Diamond of a *mangelleen* weight, but small to 20 or 30 in a *mangelleen*. They are generally of an excellent crystalline water, have a bright clear skin, inclining frequently to a pale greenish colour, are well shaped, but few of them pointed ones. There are also found amongst them several broken pieces of Diamonds, by the Country people called *Shemboes*.

In *Banugunnapellee*, *Pendekull*, and *Moodawarum*, they dig as at *Ramulconeta*, and in the same kind of Earth; they also afford Stones much alike, being neighbouring places.

Cummerwillee, *Paulkull*, and *Workull*, are not far distant, produce Stones much alike out of the same coloured Earth, but very small ones even to a 100 in a *mangelleen*.

Lungepoleur Mines are of a yellowish Earth (like those of *Quoleur*,) its Diamonds are generally well shaped, globular, few pointed, of a very good crystalline water and bright skins; many of them have a thick dark grass-green skin, some spotted also with black, that they seem all foul, yet are not so, but within purely white and clean. Their sizes are from 2 or 3 *mangelleens* downwards, but few very small.

Pootloor Mines are of reddish Earth, but afford Stones much like those of *Lungepoleur*, only smaller, under a *mangelleen*; the general sizes are of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$ of a *mangelleen*.

Punchelingull, *Shingarrampent*, and *Tondarpaar*, are also of red Earth, their Diamonds not unlike those of *Quoleur*, only rarely or never any large ones are found there.

Gundepellee hath the same Earth with the former, and produces Stones of equal magnitude; but frequently of a pure crystalline water, wherein they exceed the former.

Donee and *Gazerpellee* dig both in red Earth likewise, and afford Stones alike, the greatest part whereof are of good shapes and waters. They have also many *Shemboes*, and some of bad waters, some brown, which these people call soft or weak water'd, being esteemed of a softer and weaker body than others, by reason they have not so much life, when cut, and are subject to flaw in splitting, and on the Mill; their general product is in

Stones of middle sizes: But *Gazerpellee* has besides many large ones, and is the only Mine noted for such in the Kingdom of *Visapore*. With which concluding the description of the Mines, I shall give some account, how the Diamonds are found, and how they handle the the Earth to find them; which is as followeth:

The *Diamonds* are so scattered and dispersed in the Earth, and lie so thin, that in the most plentiful Mines its rare to find one in digging, or till they have prepared the stuff, and do search purposely for them: They are also frequently enclos'd in Clods; and some of those of *Melwillee*, the New Mine in the Kingdom of *Golconda*, have the Earth so fixt about them, that till they grind them on a rough Stone with sand, they cannot move it sufficiently, to discover they are transparent; or, were it not for their shapes, to know them from other Stones. At the first opening of the Mine, the unskilful Labourers, sometimes to try what they have found, lay them on a great Stone, and striking on them with another, to their costly experience discover they had broken a Diamond. One I knew who had an excellent Stone of 8 *magelleens*, served so by ignorant Miners he employed.

Near the place where they dig, they raise a Wall with such rugged Stones as they find at hand (whereof all the Mines afford plenty) of about 2 foot high, and six foot over, flooring it well with the same; for the laying of which they have no other Mortar than the Earth tempered with Water. To strengthen and make it tight they throw up a bank against the side of it: In one whereof they leave a small vent about two inches from the bottom, by which it empties it self into a little pit, made in the earth to receive small Stones, if by chance any should run through. The vent being stopped, they fill the Cistern they have made with water, soaking therein as much of the Earth they dig out of the Mines, as it can conveniently receive at a time, breaking the clods, picking out the great stones and stirring it with shovels, till the water is all muddy, the gravelly stuff falling to the bottom; then they open the vent, letting out the foul water and supplying it with clean, till all the Earthy substance be wasted away, and none but a gravelly remains at the bottom. Thus they continue washing till about 10 of the Clock before Noon, when they take the gravelly stuff they have washed, and spread it on a place made plain and smooth (like a Bowling-alley) for the purpose, near the Cistern, which being soon dried by the heat

heat of the Sun at that time of the day, they very curiously look it over, that the smallest bit of a stone can hardly escape them. They never examine the stuff they have washt but between the hours of ten and three, least any cloud by interposing intercept the brisk beams of the Sun, which they hold very necessary to assist them in their search; the Diamonds, not forbearing to reflect them when they touch therein, rendring themselves thereby the more conspicuous.

Some of the experteſt Labourers are employed in searching; he that sets them at work usually sitting by, and overlooking; but its hardly possible, especially where many are employed, to watch them so narrowly, but that they may steal part of what they find, as many times some of them do, and, selling it privately, convert to their own use. If they find a large Stone, they carry it not presently to their Employer, but keep on looking, having an eye on him till they observe he takes notice of it, when with a turn of their hand they give him a glimpse of it, but deliver it not till they have done work, and then very privately, it being the general endeavour to conceal what they find, least it should come to the knowledge of the Governour of the place, and he require a share, which in the Kingdom of *Golconda* is usually practiced, without respect to any agreement made with them.

The Miners, those that employ them, and the Merchants that buy the Stones of them, are generally *Ethnicks*; not a *Mussleman*, that ever I heard of, followed the employment. These Labourers and their Employers are *Tellinga's*, commonly Natives of or near the place. The Merchants are the *Banians* of *Guzzarat*, who for some Generations have forsaken their own Country to take up the Trade, in which they have had such success, that 'tis now solely engross'd by them; who corresponding with their Country-men in *Surrat*, *Goa*, *Golconda*, *Visiapore*, *Agra* and *Dillee*, and other places in *India*, furnish them all with Diamonds.

The Governours of the Mines are also Idolaters: In the King of *Golcondas* Dominions a *Tellinga Brammee* rents most of them, whose agreement with the Adventurer is, that all the Stones they find under a * *Pagoda* weight, are to be their own; all of that weight and above it to be his, for the Kings use: But although this Agreement be signed and sealed unto, he minds not at all the performance thereof, but endeavours

*A Pagoda *weight is* 9 Mangelleens.

endeavours to engroſs all the profit to himſelf by tyrannical ſqueezing both Merchants & Miners, whom he not only taxes very high, but maintaining Spies among them of their own people, on the leaſt inkling that they have been any ways fortunate he immediately makes a demand on them, and raiſes their Tax; elſe, on a falſe pretence they have found a great Stone, drubs them till they ſurrender what they have, to redeem their bodies from torment. Beſides, the Exciſe is ſo high on all ſorts of Proviſions, *Beetle*, and *Tobacco*, which to them is as abſolutely neceſſary as Meat, or at leaſt in their eſteem, that it is thereby raiſed to double that price they bear without the Government; and it is furniſht only by ſome Licens'd perſons; if any other ſhould endeavour to bring in the leaſt quantity by ſtealth, he is fined (even for one leaf of *Tobacco*) if it be a perſon of any repute or worth any thing, elſe ſeverely drub'd for it; by which courſe there is hardly a man worth 500 *l.* to be found amongſt them, moſt of them dealing by Moneys taken up at Intereſt of Uſurers, who reſide there purpoſely to furniſh them, who, with the Governour eat up their gains: ſo that one would wonder any of them ſhould ſtay, and not betake themſelves to places where they might have better uſage; as there are ſeveral in other Governments, and ſome few that have the ſenſe to remove; but many their Debts, others hopes of a great hit detains. Both Merchant and Miner go generally naked, only a poor Clout about their middle, and a Shaſh on their heads; they dare not wear a Coat, leſt the Governour ſhould ſay they have thriven much, are rich, and ſo inlarge his Demands on them. The wiſeſt, when they find a great Stone, conceal it till they have an opportunity, and then with Wife and Children run all away into the *Viſiapore* Country, where they are ſecure.

The Government in the *Viſiapore* Country is better, their Agreement obſerv'd, Taxes eaſier, and no ſuch Impoſitions on proviſions; the Merchants go handſomly clad, amongſt whom are ſeveral perſons of conſiderable Eſtates, which they are permitted to enjoy peaceably, by reaſon whereof their Mines are much more populous and better employed than thoſe of *Golconda*.

It is obſervable, that notwithſtanding the Agreement with the Adventurers of the Mines, that all Stones above a certain weight ſhall be for the Kings uſe; yet in the Metropolis of either Kingdom, as the Cities of *Golconda* and *Viſiapore* are, there is no ſeizure,

zure, all Stones are free; and the late deceased King, *Abdull Cutopshaw* of the former, and *Edelshaw* of the latter, would not only give very great prizes for large Stones, but richly vest and present the Merchant that sold them with Horses or something else of value, thereby encouraging others to bring the like. But the present King of *Visiapore* is a Child, and the King of *Golconda's* delights solely pleased on light Women-dancers, and Trick-shewers, that he neither minds *Diamonds*, nor many things more necessary, committing the Government of his Kingdom to a *Tellinga Braminee*, which the *Mussleman* not well resenting, does in some measure threaten the stability of his State.

An Account of some Books:

I. *The Primitive Origination of Mankind, considered and examined according to the Light of Nature; By the Honourable Sir* Matthew Hale, *Kt. late Lord Chief Justice of his* Majesties *Court of* Kings Bench. *London*, 1677. *in fol.*

THe Worthy and Learned Author of this Book (whose Death is exceedingly regretted by all good and intelligent men, upon the account of his singular integrity and great knowledge) hath therein principally considered these particulars:

I. That according to the Light of Nature and right Reason the World was not Eternal, but had a beginning. Where, having occasionally treated of the Excellency of Human Nature, he briefly considers the several *Hypotheses* concerning the Eternity of the World, refuting those Objections made by some against the Truths deliver'd by him.

II. That, if there could be any imaginable doubt of the Worlds having a Beginning, yet by the necessary evidence of Natural Light it doth appear, that Mankind had a beginning, and that the Successive Generations of Men were in their Original *ex non-genitis*. Where he delivers Eight Evidences to evince the Beginning of Mankind, and those so many Proofs of Fact; whereof the *First* is taken from the Antiquity of History and the Chronological Account of Times: The *second*, from the apparent Evidences of the first Foundation of the greatest and ancientest Kingdoms and Empires: The *third*, from the Invention of Arts: The *fourth*, from the beginnings of the Religions and Deities of the Heathens; where the Author conceals not the deficiency of this proof: The *fifth*, from the Decays of Human

Nature:

Nature: The *sixth*, from the History of the *Patres familiarum*, and the Original Plantations of the Continents and Islands of the World: The *seventh*, from the Gradual Increase of Mankind: The *eight*, from the Consent of Mankind.

III. That those great Philosophers, who asserted this Origination of Mankind *ex non-genitis*, both ancient and modern, and rendred it by *Hypotheses* different from that of *Moses*, were mistaken. Here the several *hypotheses* of *Plato*, *Aristotle*, *Empedocles*, *Epicurus*, *Avicon*, *Cardan*, *Cæsalpinus*, *Beregardus*, and others, are examined, and their erroneousness detected.

IV. That the *Mosaical* System, as well of the Creation of *Man* as of the *World* in general, abstractively considered, without relation to the Divine Inspiration of the Writer, is highly consonant to Reason, and upon a bare Rational account highly preferrable before the Sentiments of those Philosophers, that either thought Mankind Eternal, or substituted *Hypotheses* of his first production different from the *Mosaical*.

To all which he subjoyns certain Corollaries and Deductions made from the Premisses, as well touching the Being, the Wisdom, the Power and Providence of God, as the Duty and Happiness of Mankind.

In that *Section*, wherein the Opinions of all sorts of Philosophers touching Mans Origination are discussed, our Author takes occasion to examine, whether any *Vegetables*, and especially any *Insects* are of a spontaneous origin, or not rather of some pre-existent Seed; asserting and proving the latter of these two opinions. Examining withal, whether, supposing the Production of Insects were Spontaneous, Equivocal, and *ex putrido*, any Consequence be thence deducible for the like production of perfecter Animals, and especially of *Man*: And concluding at last, that *de facto* there hath not been any such *spontaneous* Origination of Mankind; or of any *perfect* Animal (as he is pleased to distinguish) either Natural or Casual.

II. *Tractatus Medicus de* MORBIS CASTRENSIBUS INTERNIS, *Auth.* Joh. Valentino Willio, *Medico Regio Castrense.* Hafniæ, 1676, *in* 4o.

THe Experienced Author of this Book, after he hath discoursed in general both of Health and Sickness, and of the Diseases in the Field, and their Causes and Differences; considers the Field Diseases in particular, such as the Plague, Malignant

nant Fever, Scurvy, Venereal Pox, Dejection of appetite, and Fluxes: And concerning these, he prescribes how they may be both prevented, and cured.

Among many particulars, that seem to be considerable and useful, he prescribeth, 1. Some means to appease an Excessive appetite, and particularly that of a *Transylvanian* Fryer, *viz.* Take of *Poppy seed* and *White Starch* aa ℥j. and of *Anys.* ℈ij; pulverize them, and mix therewith a sufficient quantity of good *Honey*, and make of it a Cake, which bake well, and a mouthful thereof being often dipped in *Spirit of Wine* well tinged with *Saffron*, and eaten down, will keep one from being hungry a whole day. 2. A way of untiring a Soldier after a long march, *viz.* by making a Decoction of *Mugwort*, and washing the feet therewith; or by dissolving some *Gun-powder* in luke-warm Water. 3. An excellent means of curing the Scurvy, by making only a Decoction of *Trifolium fibrinum* in beer, and giving it the Patient to drink largely and continually. 4. A general way of preventing Fluxes, by avoiding all things, that may exasperate and vitiate the acidity, bile and salt of the body. 5. A remedy to cure Epileptical fits, by taking the Spirit or Salt of *Cranium humanum*, or of *Hartshorn*, or *Elk-hoofs*, in a word, of whatever may rebate the vellicating acidity of the body. 6. An easie remedy to remove the Toothache, by making a Decoction of the shavings of *Firr-wood* in beer, and holding it hot in the mouth. 7. An easie means to cure the Dropsie, by infusing in *Whey* some *Trifolium fibrinum*, and *Vincetoxicum* or *Swallow-wort*, together with some *Elecampane-roots*, *Horse-radish*, *Elder-bark*, *Bugloss-flowers*, and *Carroway-seed*; and drinking a large draught of it twice or thrice a day, &c.

III. *Hebdomas Observationum de Rebus* SINICIS; *Auth.* Andræa Mullero, *Greiffenhagio. Coloniæ* Brandenburgiæ, *A.* 1674.

THis Tract being but lately come to the Publisher's view, he thought it not amiss, to take notice of it, by observing, that in it there is 1. An Epitome of the History of *China*, both of the most Ancient and the most Modern. 2. A Conjecture, that the true Religion and Knowledge of God hath been known in *China*. 3. A List of the Kings of *China*, out of *Mendoza* and *Martinius*. 4. A representation of the famous *Chinese* Herb, called

Guiseng, so famous for restoring decayed bodies, and so precious in *China* it self, as that there they pay thrice the weight of Silver for one pound of it. 5. A memorable Conjunction of the Planets in the time of *Noahs* Flood. 6. A Specimen of a Geographical Commentary upon *Paulus Venetus*'s Oriental History. 7. Of the Weekly distribution of Days, and their denomination taken from the Planets, being used among the *Chineses* themselves. To all which is subjoyned the History of a strange Stony-Monument found in *China* in the year 1628, importing, by its both *Chinese* and *Syriack* Inscription, made in the Eighth Century after Christ, that the Christian Religion, much after the Doctrine and Ceremonies of the *Roman* Church, had been received and practised in *China*: Which is also related by *Athan. Kircher* in his *China Illustrata*, printed 1667.

IV. *The Curious Distillatory, &c. written originally in Latin by* Joh. Sigism. Elsholt, *and Englished by* T.S. *Med. D. Physit. in Ordinary to his Majesty.* London, 1677. in 12°.

THe Author of this Tract makes it his business, therein to deliver the Art of distilling Coloured Liquors, Spirits, Oyls, &c. from Vegetables, Animals and Minerals; in the doing of which he intermixes many Experiments easie to perform, yet curious and useful, relating to the production of Colours, of Consistence, and Heat, in divers Bodies that are Colourless, Fluid and Cold; and particularly several Experiments upon the Blood (and its *serum*) of diseased persons.

As to the production of Coloured liquors, and the change of Liquors from one colour to another, the Reader may the better be informed by comparing what is deliver'd here, with what he will meet with in the instructive *History of Colours*, published by that Eminent Naturalist the Honourable *Robert Boyle*, in the year 1662. Our Author tells us, that having often considered with himself this *Problem*, Whether or no among so great a variety of Simple Bodies, Metals and Vegetables, there were not some *Species*, that would, when distilled, retain their own Native colours; he hath found, that some of them would do this, of which he hath set down his own Experiments and Observations.

To the Chapter, wherein he treats of the Appearances of various Colours, he refers at the end of his Book an Epistle of Dr.

Dr. *Mentzelius*, chief Physician to his Electoral Highness of *Brandenburg*, concerning the Experiments made upon a certain Stone found near *Berlin* in a Wood, called the *Grun-wald*, which Stone contained of Mettals, *Iron* and *Copper*; of Metallin Juyces, *Sulphur* and *Vitriol*, which lay concealed in a *Golden Marcasite*, wherewith this Stone abounded. To which Epistle is annexed an Experiment made by the Author of it upon that liquor which is contain'd in the Bladder of Gall; in which, he saith, having dissolved, some years since, some *Aloes rosatum*, the *Green* colour of the *Bile* was changed into a true *Blood* colour. The consideration of which he judgeth may be beneficial to all Mankind.

To that Chapter, wherein are deliver'd his Experiments upon Mettals and other Minerals, he refers, for a Conclusion of this Tract, a singular Experiment concerning *Tyles*, communicated to him in a Letter by Dr. *Caspar Marchius*, another of the prime Physicians to the said Elector: The short of which is this, That the reddish Colour, wherewith Tyles are tinged throughout, may be so separated from them, as that nothing of it shall be left in them: Which extracting of the Colour by an Alembick from a body that had endured so great a stress of Fire before, seems to the said Dr. *Marchius* an Experiment worthy consideration.

V. Medicina Statica, *or Rules of Health, originally written by* Sanctorius, *now Englished by* J. D. London, 1676. *in* 12o.

THis Ingenious and Useful Tract, now appearing in *English*, is known to have been long since published in *Latin* by the famous *Sanctorius*, whose design in it was, by a certain Ballance to satisfie Intelligent persons, who desire to have care of their health, that those things are true which he hath taught concerning the Weight of Insensible Perspiration, and its Causes, Time, Advantages and Disadvantages, Excess and Defect, as also touching the Air, Meat and Drink, Sleep and Waking, Exercise and Rest, and the Affections of the Mind.

As for the Ballance it self, that is a Weighing Chair, which by being about a fingers breadth distant from the floor, cannot easily be shaken, and is so framed, that when, by reason of the Refection taken-in, we are come to the just weight and measure prescribed before-hand, the Chair immediately descends a little; which descent tells the person sitting in it, that he hath

taken

taken the requiſite quantity of meat and drink. Beſides this, there is another advantage ariſing from the Uſe of this Chair, *viz.* that by it we may find out the daily Inſenſible perſpiration of our Bodies; which Perſpiration not being well conſidered, medicine often proveth ineffectual, foraſmuch as many indiſpoſitions are occaſioned by a leſſer or larger perſpiration than is required.

Now, what quantity or weight of wholeſom food is convenient for every one, and how much the Inſenſible perſpiration ought to be in their reſpective Bodies, *viz.* that perſpiration which is commonly weighed by the Chair, both theſe things may eaſily be underſtood by this Book; to which we therefore refer the Curious.

VI. Syſtema Horticulturæ, *containing in Engliſh the Art of Gardening in Three Books; by* J.W. *Gentl.* 8°.

GArdens and Nurſeries are the Life and Relief, the Health and the Beauty of *London.* Theſe with fair Orchards, ſalubrious Groves and Vineyards, are lately become the Glory of the Campaign all about *London*, for many miles in *Kent*, *Surrey*, *Suſſex*, *Middleſex*, *Hartfordſhire* and *Eſſex*: I may add *Hampſhire*, *Barkſhire*, *Buckinghamſhire*, *Oxfordſhire*, *Suffolk*, and in all the *Environs* approaching the Royal Palaces. Vineyards have climbed up *Windſor*-hill, and (as we hear) they begin to adorn ſome of the Mountains in *South-Wales*. But many remote parts of *England* are not ſo forward for the beſt ſorts of Gardens, as about *London.*

Therefore I do here take notice of a New Book for Gardens, which treateth *firſt* of the Excellency, Scituation, Soyl, Form, Walks, &c. of Gardens. *Secondly*, of all ſorts of Trees planted for Ornament or Shade, Winter-greens, Flower-trees, and Flowers. *Thirdly*, of the Kitchin-garden, and of the great variety of Plants propagated for food, and for any culinary Uſes. Illuſtrated with Sculptures, repreſenting the Forms of Gardens, according to ſome of the neweſt Models.

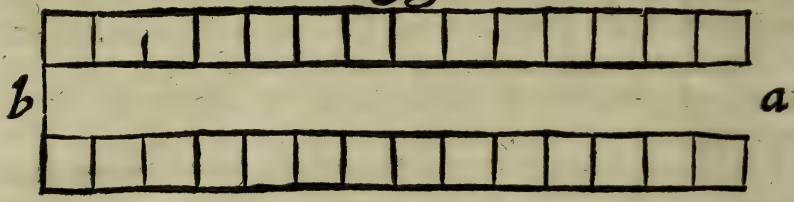
Errat: in Numb. 135.

Pag. 878. lin. antepen. read *blanqueting Trade.*

London, *Printed for* John Martyn, *Printer to the R. Society*, 1677.

BRITISH MUSEUM
NATURAL HISTORY

fig: 1



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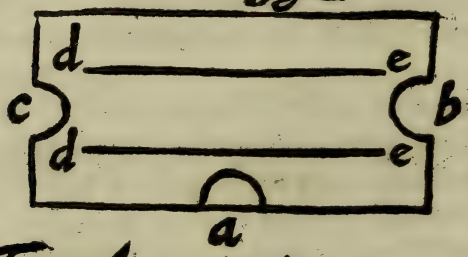

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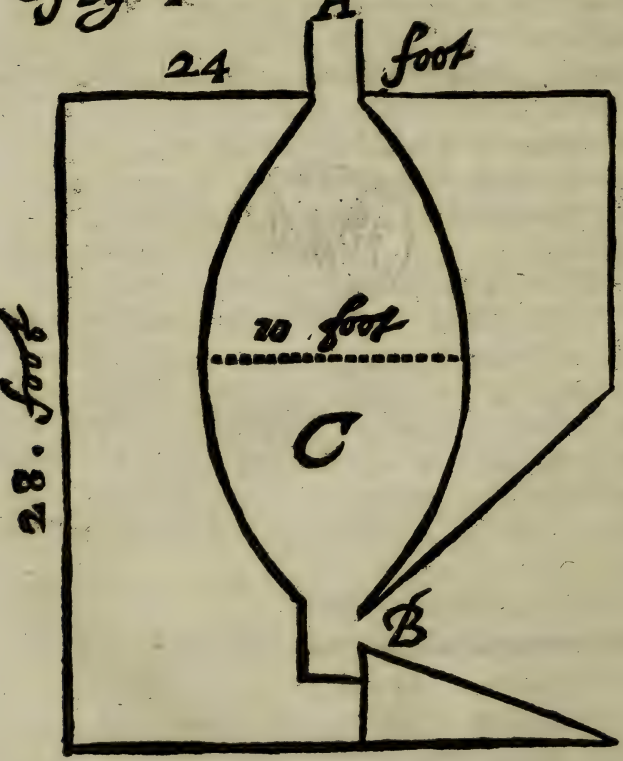
Fig: 4



PHILOSOPHICAL TRANSACTIONS.

Febr. 10. for the Months of *January* and *February*, 167⅞.

The Contents.

The manner of Hatching Chicken at Cairo; *observed by Mr.* John Graves, *and communicated by Sr.* George Ent. *A Relation concerning Barnacles*; *by Sr.* Robert Moray. *A Description of the Island* Hirta; *communicated also by Sr.* Robert Moray. *Some Observations of a* Cameleon; *made by Dr.* Jonathan Goddard. *An Account of the Iron-Works in the Forest of* Dean; *communicated by* Henry Powle, *Esquire. A Relation of the making of* Ceruse; *by Sr.* Philiberto Vernatti. *An Account of Two Books*: I. *The true Intellectual System of the Universe. The First Part*; *by* R. Cudworth, *D. D.* II. *The Six Voyages of* John Baptista Tavernier, *published in* English.

The manner of Hatching Chicken at Cairo, *observed by Mr.* John Graves, *sometime Professor of Astronomy at* Oxford; *and communicated by Sr.* George Ent, *late President of the College of Physitians*, London.

THey begin in the midst of *January* to heat the Ovens: spending every Morning an hundred *Kintars* (or an hundred pound weight) of *Camels*, or of *Buffulo's* Dung; and the like proportion at Night, till the midst of *February*. About which time the Ovens are so hot, that one cannot well endure to lay his hand upon the Walls.

After this, they put the Eggs into the Ovens to hatch the Chicken; which they continue successively till the end of *May*.

The Eggs are firſt put upon Mats in the lower Ovens, which are upon the ground; ſeven or eight Thouſand Eggs in number; and laid only double one upon another.

In the Ovens above theſe lower, the Fire is made in long Hearths or little Channels, having ſome depth to receive the Fire: from whence the heat is conveyed into the lower Ovens before mentioned. The Eggs which are directly under theſe Hearths, lie treble one upon another; the reſt, as was ſaid, only double.

At Night, when they new-make the Fires in the Hearths above-mention'd; they then remove the Eggs that were directly undermoſt (lying three one upon another) in the place of thoſe which lay on the ſides only double: and theſe being now removed, they lay treble under the Hearth, becauſe the heat is greater there, than on the ſides where the Eggs are only double.

Theſe Eggs continue in the lower Ovens fourteen days and nights: Afterwards they remove them into the upper Ovens; which are juſt over the lower. In theſe (there being now no more Fire uſed) they turn all the Eggs four times every day; *i. e.* in every 24 hours.

The 21 or 22 day the Chicken are hatch'd: which the firſt day eat not; the ſecond, they are fetch'd away by Women, who give them Corn, &c.

The Maſter of the Ovens hath a third part of the Eggs for his coſt and pains: out of which, he is to make ſuch good unto the Owners (who have two thirds in Chicken for their Eggs) if any happen to be ſpoiled or miſcarry.

The Fire in the upper Ovens, when the Eggs are placed in the lower, is thus proportion'd:

The firſt day, the greateſt Fire. The ſecond, leſs than the firſt. The third, leſs. The fourth, more than the third. The fifth, leſs. The ſixth, more than the fifth. The ſeventh, leſs. The eighth, more. The ninth, without fire. The tenth, a little fire in the Morning. The eleventh, they ſhut all the holes with Flax, &c. making no more fire; for if they ſhould, the Eggs would break.

They take care, that the Eggs be no hotter than the Eye of a man, when they are laid upon it, can well endure.

When

When the Chicken are hatch'd, they put them into the lower Ovens, which are covered with Mats. Under the Mats is Bran, to dry the Chicken: and upon the Mats, Straw, for the Chicken to ſtand upon.

The Ground-plot of the Houſe and Ovens is delineated according to *Fig.* 1. *a b* A long entrance: on each ſide of which are fourteen Ovens (ſome places have more, ſome leſs.) The bottoms and ſides of thoſe Ovens which are on the ground, are all made of Sun-dry'd Bricks; upon which they put Mats, and on the Mats the Eggs.

The top of theſe Ovens are flat, and covered with ſticks, except two long Spaces which are made of Sun-dry'd Bricks; and are the Hearths above-mentioned, in which the fires are made, to heat the Eggs lying under them in the lower Ovens.

Above theſe lower Ovens are ſo many other, made of Sun-dry'd Bricks, and arched at the top. Where alſo there are ſome holes, which are ſtop'd with Tow, &c. or left open, as they pleaſe to govern the heat in the Ovens below.

The Plant of the upper Oven is according to *Fig.* 2.

a The Mouth of the Oven, opening upon the long entrance *a b* above mentioned.

b and *c* Entrances into the Ovens adjoyning.

d e Two Hearths three or four Inches deep, in which they make the fire, to heat this and the Oven below.

The depth of the lower Oven is about $2\frac{1}{2}$ foot *Engliſh*. The ſecond, above four.

A Relation concerning Barnacles, by Sr. Robert Moray, *lately one of his Majeſties Council for the Kingdom of* Scotland.

IN the Weſtern Iſlands of *Scotland* much of the Timber, wherewith the Common people build their Houſes, is ſuch as the Weſt-Ocean throws upon their Shores. The moſt ordinary Trees are *Firr* and *Aſh*. They are uſually very large, and without branches; which ſeem rather to have been broken or worn off, than cut: and are ſo Weather-beaten, that there is no Bark left upon them, eſpecially the *Firrs*. Being in the Iſland of *Eaſt*, I ſaw lying upon the ſhore a cut of a large *Firr-tree* of about $2\frac{1}{2}$ foot diameter, and 9 or 10 foot long; which had lain ſo long out of the water, that it was very dry: And moſt of the Shells, that had formerly cover'd it, were worn

worn or rubb'd off. Only on the parts that lay next the ground, there ſtill hung multitudes of little Shells; having within them little Birds perfectly ſhap'd, ſuppoſed to be *Barnacles*.

The Shells hung very thick and cloſe one by another, and were of different ſizes. Of the colour and conſiſtence of *Muſcle*-Shells, and the ſides or joyn's of them joyned with ſuch a kind of film as *Muſcle*-Shells are; which ſerves them for a Hing to move upon, when they open and ſhut.

The Figure of the *Barnacle*-Shell is here repre-
* *See Fig.* 3. ſented *. 'Tis thin about the edges, and about half as thick as broad. Every one of the Shells hath ſome croſs Seams or Sutures, which, as I remember, divide it into five parts, near about the manner as in the Figure. Theſe parts are faſtened one to another, with ſuch a film as *Muſcle*-Shells are.

Theſe Shells hang at the Tree by a Neck longer than the Shell. Of a kind of Filmy ſubſtance, round, and hollow, and creaſſed, not unlike the Wind-pipe of a Chicken; ſpreading out broadeſt where it is faſtened to the Tree, from which it ſeems to draw and convey the matter which ſerves for the growth and vegetation of the Shell and the little Bird within it.

This Bird in every Shell that I opened, as well the leaſt as the biggeſt, I found ſo curiouſly and compleatly formed, that there appeared nothing wanting, as to the external parts, for making up a perfect Sea-Fowl: every little part appearing ſo diſtinctly, that the whole looked like a large Bird ſeen through a concave or diminiſhing Glaſs, colour and feature being every where ſo clear and neat. The little Bill like that of a Gooſe, the Eyes marked, the Head, Neck, Breaſt, Wings, Tail and Feet formed, the Feathers every where perfectly ſhap'd, and blackiſh colour'd; and the Feet like thoſe of other Water-foul, to my beſt remembrance. All being dead and dry, I did not look after the Inward parts of them. But having nipt off and broken a great many of them, I carried about 20 or 24 away with me. The biggeſt I found upon the Tree, was but about the ſize of the Figure here repreſenting them. Nor did I ever ſee any of the little Birds alive, nor met with any body that did. Only ſome credible perſons

ſons have aſſured me, they have ſeen ſome as big as their fiſt.

A Deſcription of the Iſland Hirta; *communicated alſo by Sr.* Robert Moray.

HIRTA lies, from *Snod* in *Skye*-Iſland, Weſt and by North. From the neareſt Land to it in the *Hereiſch* (from whence people ordinarily take Boat) it lies due Weſt; and is about 50 miles from the neareſt Land.

There are three Iſlands together, *Hirta*, *Soa*, and *Burra*; but *Hirta* only is inhabited. The other two are excellent Paſturage for Sheep: every Sheep there having two Lambs every year.

In *Burra* there is no landing, but to the Men of *Hirta* only, in regard of the difficulty thereof; there being but about a foot broad of Landing-place, and that only to be attempted when the Boat riſes. For their ordinary way is, when they come near the Rock, they turn the Boat and ſet the ſide to the Shore, two men, one at each end of the Boat, with two long Poles keeping it off, that the Waves daſh it not ſo violently againſt the Rock, when it riſes; at which time only the Fellow, who is to land, makes his attempt. If he miſs his Landing-place he falls into the Sea; and the reſt of the people hale him aboard; he having before a ſmall Rope faſten'd about his middle to prevent that danger. But when he ſafely lands, (which they ſeldom miſs to do) the reſt of his Fellows land one by one: except ſo many as they leave to attend their little Boat, which ordinarily is of ſix Oars.

If there be any Strangers, (as many go from the neareſt Iſlands in Summer) they muſt be tied about the middle with a ſtrong Rope; and when the men of *Hirta* have climb'd up to the top of the Rock (which is above twenty four Fathom, before they ſet their foot on graſs) they hale up the Strangers to them with the Ropes. When they have gathered as many Eggs, and kill'd as many Fowls as will load their Boat; they lower all in the Boat, and the ableſt Fellow is always left behind; who, having none to help him, muſt throw himſelf into the Sea, and ſo recover the Boat. This *Burra* lies from *Hirta* about ſix miles Northward.

Soa

Sea lies near *Hirta*, on the South-west. In this, except Fowls, there is only remarkable a Creek, where great *Seals* haunt. The people are so mad, that they go in their Boat, about four of them, in that narrow passage, to kill these *Seals* with Poles: having scarce room for their Oars, and every where seeming to close up the mouth thereof. If the Wind changeth during their being there, it is not possible to save Man or Boat.

There are several Rocks, rising out of the Sea, amongst these Islands, which the People of *Hirta* call Stacks: some ten, twenty, twenty four Fathoms above water, without any Grass upon them. On the rouud tops of the Rocks a great number of Fowls breed, and in all the Cliffs.

Amongst the rest there is one called *Stacka Donna*; upon the top whereof breedeth such an abundance of Fowls, that though it seems inaccessible, yet the men of *Hirta* have ventured to go thither. After they have landed with much difficulty, a man having room but for one of his feet, he must climb up twelve or sixteen Fathoms high. Then he comes to a place, where haviug but room for his left foot and left hand, must leap from thence to such another place before him; which, if he hit right, the rest of the ascent is easie: and with a small Cord, which he carries with him, he hales up a Rope, whereby all the rest come up. But if he misseth that Footstep, (as oftentimes they do) he falls into the Sea, and the Company takes him in by the small Cord, and sits still until he be a little refreshed, and then he tries it again; for every one there is not able for that sport.

Hirta Island is two Miles in length, accounted *Five-peny-Land*. In it there are Ten Families. The Men seldom grow old; and seldom was it ever known, that any man died in his Bed there, but was either drowned or broke his neck. The Men are strong, big, and well skinned. Their Food is only young Fowls and Eggs; their Drink Whey and Water. Much given to keeping of Holy-days; having a number of little Chappels, where sometimes they watch whole Nights, making merry together with their Offerings.

The most Service of their Women is to harrow their Land: which they must do, when their Husbands are climbing for Fowls for them.

Their

Their ordinary way of dividing their Land, is one Halfpeny to every Family. The Rocks alſo are divided, ſuch and ſuch on every Halfpeny. And there is a kind of Officer left by the Maſter of the Iſland, who governs in his abſence, and ſo regulates, that the beſt Climbers and the worſt are mixed together, that ſo none of the Land be unlaboured; that is, that all the Shelves of the higheſt Rocks be ſearched for Eggs.

The way of their Climbing, when they kill their Fowls, is thus; They go two and two with a long Rope, not made of Hemp, but of Cow-Hides ſalted, and the Thongs cut round about, and plaited ſix or nine fold. Each end of the Rope is tyed about each one of their Middle, and he that is foremoſt goes till he comes to a ſafe ſtanding, the other ſtanding firm all that time to keep him up, in caſe his foot ſhould have ſlip'd: When the foremoſt is come to a ſafe ſtanding; then the other goes, either below or above him, where his buſineſs is; and ſo they watch time about; ſeldom any of them being loſt, when this is obſerved.

The aforeſaid Officer, when any couple is to be Married, brings them to one of their Chappels, and adminiſters an Oath to them; ſo they are married.

Their Children, when they come to the Age of 15 or 16. or thereabout, come with the Maſter of the Iſle to the *Hereiſch* Iſland, and are there Baptized.

An ordinary way of killing the Fowls in the Miſt is this, Some of theſe Fellows lie beſide the Door of the little Houſes they have in their Iſlands, flat upon their banks, and open their Breaſts. Which, when the Fowls perceive, they ſit upon them, and are preſently catch'd, and their necks broke. One Fellow has kill'd hundreds of Fowls in one night, after this manner.

Sometimes they ſet Grins on the very top of the higheſt Rocks, and make them ſtrong for great Fowls. One being ſetting of theſe Grins, as he was walking along his great Toe was catc'd in one of them, which made him ſtumble and fall down: yet the Grin being faſt and ſtrong, kept him hung with his head downward, till thoſe that miſſed him came in the morning, and found him ſo fallen.

Some Observations of a Cameleon, *made by Dr.* Jonathan Goddard, *late Professor of Physick at* Gresham-*College*, London.

See Vol. 4. *Nu.* 49. *p.* 991.

THis was a female, as appeared by Eggs found within. As to the Colour of the Skin, it clearly appears mixed of several Colours, like a medly-Cloth: lighter towards the belly; otherwise, near upon it, equally mixed. The Colours discernable are Green, a Sandy Yellow, a deeper Yellow towards a Liver-colour: and indeed one may easily fancy some mixture of all or most Colours in the Skin; whereof some are more predominant at some times. There are some permanent black Spots on the ridge of the Back, and on the Head.

Upon excitation or warming she becomes suddenly full of black Spots of the bigness of Great-pins heads, equally dispersed on the sides, with small black streaks on the Eye-lids; all which afterward do vanish.

The Skin is grained with globular inequalities, like the Leather called *Shagreen*, or the Eggs of Flies. The grosser grain is about the Head, next on the ridge of the Back, next on the Legs; on the Sides and Belly finest. Which perhaps in several postures, may shew several Colours. And when the Creature is in full vigour, may also have in some sort *rationem speculi*, and reflect the Colours of bodies adjacent: which, together with the mixture of Colours in the Skin, may have given occasion to the old Tradition, of changing into all Colours.

The Eyes resemble a *Lens* or *Convex Glass* set in a Versatile globular Socket; which she turn'd backward, or any way without moving her Head. And ordinarily, the one a contrary or quite different way from the other.

Her Tongue, (which she was never seen to put forth of late, though she often opened her mouth wide) was easily drawn out, when she was dead, to half the length of her Body, being round and full toward the end, like a Pestil, with some cavity at the extremity: having a Bone about half the length of it, toward the Root; over which also the fore-part would slip backward. The Bone, where connected to the Body, is bifurcated. She hath Teeth plainly to be felt and seen above and below, on the whole circumference of the Jaw.

The Trunk of the Body, for the Structure of it, is all *Thorax* or Breast, having Ribs from the Neck to the seting on of

the

the Tail. Of two ſorts, the larger above, tending backward from the Spine or Back-bones. The other, from the extremities of the former, tending forward, as in the Breaſts of Fowls: being with the ſame ſort of thoſe in Fowls, which by *Aquapendent* are called *Coſtulæ*.

There is a kind of Diaphragm, a thin tranſparent Membran, as in Birds, ſeparating a ſmall portion, about the fourth part of the Cavity, next the Belly, from the reſt. Wherein is contained a ſmall Ventricle, connexed to the *Gula*: to which is continued an Inteſtine, having ſome little convolution in the conveyance of it; which extended might be about the length of the whole Body, with Head and Tail. The Excrements therein black, or of a ſad *French* Green.

She had a ſmall thin Liver contiguous to the upper part of the Diaphragm: in part divided into two Lobes, of a blackiſh or very ſad colour.

The Lungs ſeemed to be made of Membranous cells or diviſions, very thin and tranſparent, reſembling a little light froth.

The Heart was firm and fleſhy, but very ſmall; and at the very fore end of all the Breaſt or Body.

At the hinder end of the Body was a double Ovary, conſiſting of five or ſix eggs (of the bigneſs of the Greateſt-pins heads, and ſticking to the Back) on each ſide: of the ſame colour and conſiſtence with thoſe of the Yolk of an Egg.

An Account of the Iron-Works in the Foreſt of Dean, *communicated by* Henry Powle, *Eſquire.*

THe Foreſt of *Dean* (comprehending that part of *Gloceſterſhire*, that lies betwixt the Rivers of *Wye* and *Severne*) conſiſts generallyy of a ſtiff Clay: which, according to the nature of thoſe Soyls, is very deep and miry in the Winter, and in the Summer as dry and parched. The Country is full of Hills, but ſo as you may rather call it Uneven, than Mountainous, they being no where high, and rarely of a ſteep aſcent. Betwixt them run great ſtore of little Springs, of a more browniſh colour than ordinary Waters, and often leaving in their paſſage tinctures of Ruſt. The Ground is naturally inclined to Wood, eſpecially Haſle and Oak; of which laſt ſort it hath produced formerly moſt ſtately Timber; though now, almoſt totally devoured by the increaſe of the Iron-Works.

Upon the Surface of the Earth, in many places, lie an abundance of rough Stones, some of them of a vast bulk; but where they sink their Mines, they rather meet with Veins of Scaly Stone, than hard and solid Rocks. Within the Forest they find great plenty of Coal and Iron-Ore; and in some places, Red and Yellow Oker: which are all the Minerals, that are yet discovered there.

I have been the more particular in this description, because I think it not impossible, that by an exact comparing of the Nature and Productions of such Soyls, where Minerals are usually formed, we may arrive to a certain knowledge, or at least a very probable conjecture, in what places we ought to search after their several sorts, and when to desist.

The Iron-Ore, which is the principal Manufacture here, and by which most of the Inhabitants subsist, is found in great abundance in most parts of the Forest: differing both in colour, weight, and goodness. The best, which they call their Brush-Ore, is of a Blewish colour; very ponderous, and full of little shining Specks like grains of Silver. This affords the greatest quantity of Iron; but being melted alone produceth a Metal very short and brittle, and therefore not so fit for common use.

To remedy this Inconveniency, they make use of another sort of Material, which they call their Cynder, and is nothing else, but the Refuse of the Ore after the Metal hath been extracted; which being mingled with the other in a due quantity, gives it that excellent temper of Toughness, for which this Iron is preferred before any that is brought from Forein parts.

But to understand this rightly, it is to be noted, That in former times, when their Works were few, and their Vent small, they made use of no other Bellows, but such as were moved by the Strength of men: by reason whereof their Fires were much less intense, than in the Furnaces they now employ. So that having in them melted down only the principal part of the Ore; they rejected the rest as useless, and not worth their charge. This they call their Cynder, which is now found in an unexhaustible quantity through all parts of the Countrey, where any former Works have stood.

After they have provided their Ore, their first work is to Calcine it: which is done in Kilns, much after the fashion of our ordinary Lime-Kilns. These they fill up to the top with Coal

Coal and Ore, *ſtratum ſuper ſtratum*, until it be full; and ſo putting Fire to the bottom, they let it burn till the Coal be waſted, and then renew the Kilns with freſh Ore and Coal, in the ſame manner as before. This is done without Fuſion of the Metal, and ſerves to conſume the more droſſy parts of the Ore, and to make it friable; ſupplying the Beating and Waſhing, which are uſed to other Metals.

From hence they carry it to their Furnaces, which are built of Brick or Stone, about 24 foot ſquare on the outſide, and near 30 foot in height. Within, not above 8 or 10 foot over, where it is wideſt, which is about the middle; the top and bottom having a narrower compaſs, much like the ſhape of an Egg, as in the Figure. *See Fig.* 4. A *the Tunnel*, C *the Furnace*, B *the Mouth of the Furnace.*

Behind the Furnace are placed two huge pair of Bellows, whoſe Noſes meet at a little hole near the bottom. Theſe are compreſſed together by certain Buttons, placed on the Axis of a very large Wheel, which is turn'd about by Water, in the manner of an Overſhot-Mill. As ſoon as theſe Buttons are ſlid off, the Bellows are raiſed again by the counterpoiſe of weights; whereby they are made to play alternately, the one giving its blaſt all the time the other is riſing.

At firſt, they fill theſe Furnaces with Ore and Cynder intermixt with Fuel, which in theſe Works is always of Charcoal; laying them hollow at the bottom, that they may more eaſily take fire: But after they are once kindled, the Materials run together into a hard cake or lump, which is ſuſtained by the faſhion of the Furnace, and through this the Metal, as it melts, trickles down into the Receivers, which are placed at the bottom, where there is paſſage open, by which they take away the Scum and Droſs, and let out the Metal as they ſee occaſion.

Before the Mouth of the Furnace lies a great Bed of Sand, wherein they make Furrows of the faſhion into which they deſire to caſt their Iron. Into theſe, when their Receivers are full, they let in their Metal; which is made ſo very fluid by the violence of the Fire, that it not only runs to a conſiderable diſtance; but ſtands afterwards boiling for a good while.

After theſe Furnaces are once at Work, they keep them conſtantly employed for many Months together, never ſuffering the Fire to ſlacken night nor day; but ſtill ſupplying the

the waſte of the Fuel and other Materials with freſh, poured in at the top.

Several attempts have been made to bring in the uſe of Sea-coal in theſe Works, inſtead of Charcoal; the former being to be had at an eaſie rate, the latter, not without great expence: but hitherto they have proved ineffectual. The Workmen finding by experience, that a Sea-coal Fire, how vehement ſoever, will not penetrate the moſt fix'd parts of the Ore, and ſo leaveth much of the Metal unmelted.

From theſe Furnaces, they bring their Sows and Pigs of Iron (as they call them) to their Forges. Theſe are of two ſorts, though ſtanding together under the ſame Roof: one they call their Finery, the other, the Chafery. Both of them are open Hearths, on which they place great heaps of Sea-coal, and behind them, Bellows, like to thoſe of the Furnaces, but nothing near ſo large. Into the Finery, they firſt put their Pigs of Iron, placing three or four of them together behind the fire, with a little of one end thruſt into it. Where ſoftening, by degrees they ſtir and work them with long Bars of Iron, till the Metal runs together into a round Maſs or Lump, which they call a Half-Bloom. This they take out, and giving it a few ſtrokes with their Sledges, they carry it to a great weighty Hammer, raiſed likewiſe by the motion of a Water-wheel: where applying it dexterouſly to the blows, they preſently beat it out into a thick ſhort ſquare. This they put into the Finery again, and heating it red hot, they work it out under the ſame Hammer, till it comes into the ſhape of a Bar in the middle, with two ſquare knobs in the ends. Laſt of all, they give it other Heatings in the Chafery, and more workings under the Hammer, till they have brought their Iron into Bars of ſeveral ſhapes and ſizes; in which faſhion they expoſe them to Sale.

All their Principal Iron undergoes all the forementioned preparations: yet for ſeveral purpoſes, as for the Backs of Chimneys, Hearths of Ovens, and the like, they have a ſort of Caſt-Iron; which they take out of the Receivers of the Furnace, ſo ſoon as it is melted, in great Ladles, and pour it into Moulds of fine Sand: in like manner as they caſt Braſs and other ſofter Metals: but this ſort of Iron is ſo very brittle, that being heated, with one blow of a Hammer it breaks all to pieces.

Though

Though this fault be moſt found in this ſort of Iron; yet, if in the working of their Beſt ſort they omit any one Proceſs, it will be ſure to want ſome part of its Toughneſs, which they eſteem its perfection.

A Relation of the making of Ceruſs, *by Sir* Philiberto Vernatti.

FIrſt Pigs of clean and ſoft Lead are caſt into thin Plates a yard long, ſix inches broad, and to the thickneſs of the back of a Knife. Theſe are rolled, with ſome Art, round; but ſo as the Surfaces no where meet to touch: for where they do no *Ceruſs* grows.

Thus roll'd, they are put each in a Pot juſt capable to hold one, upheld by a little Bar from the bottom, that it come not to touch the Vinegar, which is put into each Pot, to effect the converſion.

Next a ſquare Bed is made of new Horſe-dung, ſo big as to hold 20 Pots abreaſt, and ſo to make up the number of 400 in one Bed.

Then each Pot is covered with a Plate of Lead; and laſtly all with Boards, as cloſe as conveniently can be. This repeated four times, makes one heap, ſo called, containing 1600 Pots.

After three Weeks the Pots are taken up, the Plates unrolled, laid upon a Board, and beaten with Battle-dores till all the Flakes come off. Which, if good, prove thick, hard and weighty: if otherwiſe, fuſſy and light; or ſometimes black and burn'd, if the Dung prove not well order'd: and ſometimes there will be none.

From the Beating-Table the Flakes are carried to the Mill; and with Water ground between Millſtones, until they be brought to almoſt an inpalpable fineneſs. After which it is moulded into ſmaller parcels, and expoſed to the Sun to dry till it be hard and ſo fit for uſe.

The Accidents to the Work are,

That two Pots alike ordered, and ſet one by the other, without any poſſible diſtinction of advantage, ſhall yield, the one thick and good Flakes, the other few, and ſmall or none: which happeneth in greater quantities, even over whole Beds ſometimes.

Some-

Sometimes the Pots are taken up all dry, and so sometimes prove best; sometimes again they are taken up wet. Whether this ariseth from the Vapors coming from below, or the moisture that is squeezed out by the weight of the Pots, we cannot discern.

This we observe, That the Plates that cover the Pots, yield better and thicker Flakes, than do the Rolls within. And the outsides, next to the Planks, bigger and better than the insides, next to the Rolls, and the Spirits that first arise out of the Vinegar.

We therefore question much, Whether the strongest bodied Vinegar, or the quickest and sharpest, be the most effectual?

The Accidents to the Workmen are,

Immediate pain in the Stomack, with exceeding Contorsions in the Guts, and Costiveness that yields not to Catharticks, hardly to often repeated Clysters: best to Lenitives, Oil of *Olives*, or Strong new Wort. It brings them also to acute Fevers, and great Asthma's or Shortness of Breath. And these we find effected principally by the Mineral Steams in the casting of the Plates of Lead, and by the Dust of the Flakes. Also by the Steams coming from out of the Heaps, when the Pots are taking up.

Next, a *Vertigo*, or dizziness in the Head, with continual great pain in the Brows, Blindness, Stupidity, and Paralytick Affections; loss of Appetite, Sickness, and frequent Vomitings, generally of sincere Phlegm, sometimes mixed with Choler, to the extreamest weakning of the Body. And these chiefly in them that have the charge of Grinding, and over the Drying Place.

An Account of Two Books.

I. *The True Intellectual System of the Universe. The First Part. Wherein all the Reason and Philosophy of Atheism is confuted, and its impossibility demonstrated: By* R. Cudworth, *DD.* London, *printed for* Rich. Royston, 1678. in fol.

THE Reverend and Learned Author acquaints us in his Preface with his whole Design, it being to demonstrate these three Things: 1. That there is an Omnipotent Understanding Beeing, presiding over All. 2. That this Beeing hath an Essential Goodness and Justice: the differences of Moral Good and Evil, not being by Will and Law only, but also by Nature; according

according to which the Deity acts and governs Mankind. 3. That Neceſſity not being Intrinſecal to the Nature of every thing, but Men having ſuch a Power over their own Actions, as to render them accountable for the ſame; there is therefore a Diſtributive Juſtice running through the World.

The firſt of theſe (againſt Atheiſm) taketh up this whole Book: which is divided into five Chapters. Whereof, the firſt is an account of the *Atomick Phyſiology*, as made the foundation of the Democritick Fate, that is, the Atomick Atheiſm, or Material neceſſity of All things without a God.

Of the *Atomick Phyſiology* he diſcourſeth principally two things: 1. That it was not the Invention of *Democritus* or *Leucippus*; but of much greater Antiquity. Proved from the Tradition tranſmitted by *Poſidonius, &c.* that it was derived from *Moſchus* a *Phœnician*, living before the *Trojan* Wars, and probably the ſame with *Mochus*, mentioned in *Jamblichus*. From *Ariſtotles* Teſtimony hereof. And in that *Pythagoras*, *Empedocles*, and moſt of the Ancient Phyſiologers, were *Atomiſts*. And by other Arguments. And that therefore, all that was true of *Democritus* and *Leucippus*, is only, that they were the firſt Atheizers of the Ancient *Atomick Phyſiology*.

2. That this *Atomick Phyſiology*, rightly underſtood, is no Nurſe to Atheiſm, but the greateſt defence againſt it: being founded upon this Principle, That Nothing can be cauſed by Nothing. From whence it was concluded, That in Natural Generations there was no New real Entity produced: And conſequently, That the qualities and forms of Inanimate Bodies, are no Entities really diſtinct from the Magnitude, Figure, Site, and Motion of Parts. And, that Souls are ſubſtances Incorporeal, not generated out of Matter. Aſſerted by *Pythagoras*, *Parmenides*, *Empedocles*, *Anaxagoras*, and all the beſt of the Ancients. That upon the ſame Principle was founded, the *Pythagorick* Doctrines of the *Præexiſtence* and *Tranſmigration* of Souls. And, that whoever admits and underſtands the *Atomick Phyſiology*, muſt alſo acknowledge *Incorporeal Subſtance*: which is the overthrow of Atheiſm. From theſe Premiſſes he concludes, That the ancient *Moſchical Phyſiology* conſiſted, of *Atomical Phyſiology* and *Pneumatology*. And was mangled by *Democritus*, who ſuperſeded their *Pneumatology*: and by *Plato* and *Ariſtotle*, who ſuperſeded their *Atomology*.

In the Second Chapter are contained, all the pretended grounds of Reason (except those peculiar to the *Hylozoick* form, directly contrary to the *Atomick*) for the Atheistick Hypothesis. As, That there is no *Idea* of God. Nothing can be created out of Nothing. The Universe can consist of nothing but Space and Body. Assertion of a Deity, arising meerly from the abstract Names and Notions of things. No Beeing essentially Incorruptible, because Corporeal. The first Principle, no Understanding Nature. Soul and Mind begot of Senseless Atoms Nothing Immortal. No unmoved first Mover. All Knowledge and Idea's, junior to the World. The World Ill made. No Providence: nor would it consist with the Deity. Theism inconsistent with Civil Government. Therefore all sprung from Nature and Chance. All which he lays down fairly, and to the greatest advantage of the Atheist.

The Third Chapter is an Introduction to the confutation of *Atheism*: containing a particular account of all the several forms of *Atheism*. And first of the *Hylozoick*, not noted by any Modern. *First* started by *Strato*, in opposition to the *Democritick* Hypothesis: and reviv'd of late by some, so sagacious as to see that Hypothesis indefensible. *Next*, That before *Democritus* the most ancient *Atheistick Hypothesis* was, the Eduction of all things, Life and Understanding it self, out of Matter, in the way of generable and corruptible Qualities; which he styleth the *Hylopathian* or *Anaximandrian*; *Anaximander* being the Author of it, whose supream Deity was Infinite Matter: and who was the first *Atheistick Philosopher*. Here also of the *Atheistick Theogoniism*; which, though it asserted Many Gods, and also One Supream, yet, that all were generated out of Night and *Chaos*, and thereinto corruptible. Besides these, of a *fourth*, which seemeth to be but the corruption of *Stoicism*; and which he styleth, the *Cosmoplastick Form*. This concluded the whole World, not to be an Animal (as the Pagan *Theists* generally supposed) but to be One huge Plant, having an Artificial, Plastick and Vegetable Nature, as its highest Principle. All the said Forms agreeing in this, That all Animality conscious Life and Understanding is generated out of Senseless Matter, and corruptible into it. Whereto he subjoyns a digression of an *Artficial Plastick Nature*; asserting, that it is the Instrument of the Deity. Agreeable to the sense of best Philosophers. 'Tis no Occult quality. The Divine Art embodied,

bodied. Its Opificer. Without Conſciouſneſs. Acts Fatally and Sympathetically. Incorporeal. Lodg'd in the Souls of Animals. A Cenſure of *R. Des Cartes*'s Philoſophy.

In the fourth Chapter the *Idea* of God is declared, in anſwer to the firſt *Atheiſtick* Argument. A large account of the Pagan *Polytheiſm*; to remove a grand Objection that lay in the Authors way from thence, againſt the *Naturality* of the *Idea* of God, as including Unity or Onlyneſs in it. The rather by him thus fully given, becauſe he had not met with it ſufficiently performed before. *Eugubinus*, who hath laboured moſt in this Subject, having, beſides other things, given no account of the many Pagan *Poetical* and *Political* Gods, what they were; yet a great part of the Authors performance, to prove them really to have been, but the *Polyonymy* of One God. The Author alſo largely inſiſteth upon the *Trinity*, in order to the giving a full account of the Pagan *Theology*: it being certain, that the *Pythagoreans* and *Platonicks*, if not others, had their *Trinity*. Of all which, moſt of the principal Heads diſcourſed, are theſe that follow, *viz.*

That there muſt be ſome unmade Subſtance, the principle of Things made. The Aſſerters of two unmade Principles, *God* and the *Matter*. *Omnipotence* included in the Divine Idea. *Knowledge* and *Power* alone, make not up a God. A *Good* ſuperiour to Knowledge. *Morality* in the Nature of God. *Onlyneſs*, contained in the Divine Idea: Againſt which, the Pagan *Polytheiſm* the grand Objection. The *Ditheiſtick* Doctrine. Of the *Platonick* Origin of Evils. *Pagans*, not generally *Ditheiſts*. Things of *Nature* perſonated and Deified, but ſeveral Names of God. All the *Pagan gods* derived from one Supream. The Pagan *Theogonia* the ſame with the *Coſmogonia*. The *Pagans Eternal gods* derived from one Supream. This, denoted by Appellatives, as Δαίμων, τὸ Θεῖον. Θεοί, taken only for the Inferiors. Champions for *Paganiſm* aſſert one Supream, as *Apollonius Tyaneus*, *&c.* Of the *Sibylline* Oracles. The *Triplaſian Mithras* of the *Perſians*. The *Chaldaick* Trinity, and Oracles. Hiſtory of *Orpheus*, no Romance. A *Polytheiſt*, yet aſſerter of one Supream. A Trinity, part of the *Orphick Cabala*. Grand *Arcanum* of the *Orphick Theology*, that God is All. This a ground of *Polytheiſm* amongſt as well the *Egyptians*, as *Greeks* and other Nations. Names of *Greekiſh* gods from the *Egyptians*. Who were yet conſtant aſſerters of the *Coſmogonia*: and of Incorporeal Subſtance. Some *Triſmegiſtick* Books counterfeit, not

all. The ancient *Egyptian Theology*, that God is All, τὸ πᾶν. *Pan*, God diffus'd through all. *Eiton*, *Emeph*, and *Phtha*, the *Egyptian* Trinity. Poets, depravers of the *Pagan* Theology. *Hesiod's Theogonia*, meant of the Inferior gods. *Sophocles*, *Euripides*, &c. asserters of one Supream. Consent of the *Latin* Poets herein. *Epicurus*, the only Philosopher asserting many Independent gods. *Pythagoras*'s *Monad*. His *Tetractys*, the *Tetragrammaton* or *Hebrew* Name of God consisting of four letters. *Heraclitus*, *Anaxagoras*, *Parmenides*, *Melissus*, *Zeno Eleates*, *Empedocles*, *Timæus Locrus*, *Euclides*, *Antisthenes*, *Socrates*, *Plato*, *Aristotle*, *Speucippus*, *Xenocrates*, *Theophrastus*, *Cleanthes*, *Cicero*, asserters of One Supream. So, *Symmachus*, *Seneca*, *Plutarch*, *Galen*, *Maximus Tyrius*, *Plotinus*, *&c.* *Varro*'s Natural Theology, distinct from the Mythycal and Civil. Vulgar *Pagans* acknowledg'd also Many gods, yet One Supream. The *Roman* and *Samothracian* Trinity or *Cabiri*. Κύριε ἐλέησον, the *Pagan* Litany to the Supream God. *Pagans* held the World to be one Animal. Not cut off from the Deity. Their knowledge of One Supream asserted by the *Hebrews*. Testified in Scripture. They worshipped the rest as *Mediators*. The Supream God *Polyonymous* amongst them. *Pan*, *Janus*, *Genius*, *Saturn*, *&c.* all Names of the Supream God. More popular and Poetick Gods, the same. The *Philosophick* and *Physiologick* Theology different. *Apuleius*'s reduction of the *Pagan* Gods to *Plato*'s Idea's. God, according to the *Pagan* Theology, pervadeth all things. A higher strain of the *Pagan* Theology, that God is all things. The parts of the World personated and Deify'd, their *Physiological* Theology. This, not *Varro*'s Natural. They hence approve of worshiping God in his Works. *Accidents* and *Affections* by them personated and Deify'd. Of those *Pagan* Theologers, who made God the Soul of the World. To these, the parts of the World, the parts of God. This Mundane Animal worshiped in its several parts. Of the *Platonists* supermundane and Eternal Gods, Νοῦς, Ἕν & Ψυχή. This Trinity of the *Pagans* derived from a divine *Cabala*. A Trinity of Gods. *Homoousian*. Yet dependent and subordinate. The agreement and disagreement of this, and the Christian. The *Tritheistick Trinity* of some of the Fathers. The true Notion of Ὁμοούσιος. The *Cabala* of the Trinity, altered by Junior *Platonists*. *Proclus*'s *Monad*, before the Trinity, &c.

The last Chapter confutes all the *Atheistick* Grounds; demonstrates

monſtrates the Impoſſibility of *Atheiſm*; and by neceſſary Inference from undeniable Principles, the actual Exiſtence of a God. Together with the perfection of the Creation. Of which, moſt of the principal Heads are theſe following, *viz.*

Senſe, not Knowledge. Thoughts of what is not in ſenſe, an evidence of things not ſenſible. God, not unconceivable. Certain, that Never Nothing. *Eternity* a Philoſophick Attribute of the Deity. The ſenſe of τὸ Θεῖον, φθαρτόν. *Atheiſm* founded in diſtruſt and ignorance of Cauſes. *Atheiſts* ignorant of the cauſe of themſelves: of Motion: of the Mundane Regularity. Things made for Ends. *Nature*, Mechanical and Vital. *Chance*, not Artificial. God, not Ἀυλεργῶν ἄπαυλα. The *Mechanical Theiſt* confuted. *Idea* of God, not from amplification of Imperfect things, or other feigning power of the Soul. *Atheiſm* confuted by *Apparitions*, *Witches*, and *Demoniacks*. By Miracles. How they confirm a Prophet. By Oracles. Scripture triumphing over *Pagan* Oracles. Senſe, phantaſtical and relative. Mind, reaches abſolute Truth. The *Carteſian*, and other demonſtrations of a God, from his *Idea*. Intellection, not the Image of Senſibles. Eternal truths and Intelligibles. In what ſenſe, Nothing out of Nothing. *Atheiſts* make more out of Nothing, than *Theiſts*. Matter, not neceſſarily exiſtent. Arguments againſt an Incorporeal Deity, confuted. Extenſion and Entity, not the ſame. Senſe and Imagination, not the Meaſures of things. Souls always united to ſome Body, the old Philoſophick *Cabala*. The Souls Spirituous body (ſuppoſed) after Death. The Ἀυτοειδὲς, third, or Heavenly Body. Myſtery of the Reſurrection, a ſpiritual and heavenly Body. To the majority of Fathers, Demons, and Angels Bodied. Reaſons for unextended Subſtance. A Firſt Mover, demonſtrated. Thoughts, not action of Objects. Scale of Entity, aſſerted. Grand Objection againſt the Subſtantiality of all Souls, anſwer'd. Divine Goodneſs aſſerted. Inclination of the Earths *Axis*, argueth Providence. Evils, from the neceſſity of Imperfect Beings. Providence in the Oeconomy of Humane affairs. Not parts of the World alone, but the whole to be conſider'd. The Vaſtneſs of it. Future and paſt, with preſent. Providence, not laborious and diſtractious to the Deity. *Atheiſts* Queries, anſwer'd. *Atheiſts* Politicks, unravel'd. Founded in the Villanizing of Humane Nature, &c.

The whole Work aboundeth with variety of good Reading, nd Judicious Diſcourſe thereupon. II. *The*

II. *The Six Voyages of* John Baptista Tavernier, *Baron of* Aubonne, *through* Turky *into* Persia *and the* East-Indies. *In* English. *London* 1678. in fol.

ALthough there have been formerly some Observations recited out of this Book; yet being a Work so full of Natural, as well as other History; it doth therefore justly merit the following Account.

The whole Work is divided into Two Parts. The first, into Five Books: whereof the three former describe the Roads from *Paris* to *Ispaham*, the Capital City of *Persia*. The two latter are an History of *Persia*.

Of the Roads, he gives an account of no less than 21 considerable ones; with the several conveniencies and inconveniencies, times and stations, and ways of Travelling in them all. Particularly of *Caravansera's* and Government of the *Caravans*.

As he passeth, he sets down whatever he saw observable of the Ground, Waters, or Air of the Countrey. As for Example, a Plain of 12 hours Riding all pure Salt, *p.*31. Another Salt Plain of 2 Leagues broad, and 10 long, *p.*39. *Ararat* and other Mountains hid in the Clouds for three months together. Mountains of Salt, *p.* 143. Description of the *Persian* Gulph, Lake of *Antioch*, Black-Sea, *Tigris*, *Euphrates*. That Water is scarce throughout *Persia*. That there is no River in it able to carry a Boat, except *Aras*. Seldom rains about *Ispaham*, but in *April*. About *Lar*, sometimes not of 3 years together. The Air of *Bandor* and *Gomron* most unwholsom by the West-Southwest Winds after *March*.

He notes the extent and divisions of the Empire of *Persia*. Describes the Countries, Cities, and People of *Georgia*; where the best Souldiers, and the Women the fairest in all *Asia*. *Mengrelia*, *Comania*, *Circassia*. The *Gaurs*, *Kalmouchs*, Lesser *Tartars*, Christians of St. *John*. Of *Cyprus*, *Santorini*, *Chio*, *Ormus*, *Malta*, *Cyclades*, *Milo*, *Paros*. Of the principal Cities about the *Black-Sea*: Of *Ispahan*, *Outfa*, the capital City of *Mesopotamia*; *Smyrna*; *Aleppo*, the capital City of *Syria*; *Syracuse*, *Messina*, *Nineveh*, *Balsara*, *Bagdat*, *Corinth*, *Athens*, *Ephesus*, *Antioch*, *Sardis* *Philadelphia*, and many others.

Of these he observeth sometimes the original and number of Inhabitants. Usually their Buildings, as the great *Piazza* in *Ispaham*, the *Mosque* at *Tauris*, Churches, Colleges, Inns, Private Houses,

Houſes, Ruines of the Temple of *Diana*, Funeral Monuments, Bridge of *Zulpha*, *Halicacara* a great Town, the Houſes whereof built all Underground. *Chamber*, *Bedſtead*, *Table*, and *Cupboard*, all hew'd out of the Rock, &c. Some people dwelling only in Hollow Rocks. Others only in Tents and Wagons. *Hezardgerib*, the faireſt Garden in all *Aſia*, *&c.*

Their Habits. Games. *Hawks* taught to fly at the *Wild Boar*, *Aſs* and *Goat*. Of their Race-Footmen. Moſt exact Shooting. Cuſtomes, Languages, Writing, and Seals.

Their Feaſts, and Diet. How *Potargo* made. *Acorn-Bread* the only food of the Poor people near *Sherazoul*. People of *Circaſſi* make drink of *Millet*, and chooſe their Bread of that rather than *Wheaten*. Leſſer *Tartars* drink no Water by their good will, but only Milk; refuſe no Diet but *Swines*-fleſh; never eat *Salt*, yet live long. How they feed their Cattel, &c.

Of their Diſeaſes, Phyſicians, and Cures, ſome account. Gangrene in the Throat and Mouth a diſeaſe common about *Erivan*. Worms bred in the Limbs of a wonderful length. How the people of *Comania* and *Circaſſia* treat the ſick, and cure the Head-ach, &c.

Commodities, Trades, and Coins. *Tauris* the Mart for *Turky*, *Muſcovy* the *Indies*, and *Perſia*. The Trade of *Candy*, and the chief Iſles of the *Archipelago*, and of *Smyrna*, *&c.* They are excellent *Damaskers*. Have curious Manufactures of *Gold*, *Silver* and *Silk*, the beſt whereof from *Cachan*. Tells from whence *Corins*, *Sallet-Oyl*, *Silks*, the beſt *Glue*, the fineſt *Wool*, the *Shagrin* skin, fine blue *Goat-Leather* skins, *Valanede* for dying of Leather, &c. Nothing ſold by Meaſure, but all by Weight. They have no *Gold* Coyn currant, but only *Silver* and *Copper*, whereof the Author gives ſeveral Figures; and tells at what rates the exchange of *Mony* is made, &c.

The Government of the Empire, Juſtice, and manner of Executions. The Exchequer. Officers of the *Cuſtome-Houſes*. Diviſion of Time. Genealogies of the *Perſian* Kings. How their Children bred. Their Revenues. Eccleſiaſtical Government and Revenues. *Marriages*, *Chriſtenings*, and *Burials*, *&c.*

Of Animals; as of the breeding, nature, and ſorts of *Camels*, *Bufalo's*, *Arabian* Horſes. *Jackauls*, a kind of *Foxes*. *Pigeons* as big as *Hens*. *Hawks*, how bred. A Lake 6 Leagues off *Tauris* full of *red Ducks*. *Locuſts*. Grand fiſhery for *Sturgeon* near *Queli*, &c.

Of Plants; as a particular ſort of *Quince Peppin*. Some *Orange* trees as tall as *Wallnut*, and thicker than 2 men can fathom. How they order their *Vines*, and keep their *Wines*. Blue *Lillies*. Beſt *Gauls* near *Tauris*. Beſt *Water-Melons* at *Cauverſtan*, &c.

Of their Pearls: the Iſland *Bahren* the great fiſhery and Market for them. A tranſparent Pearl. Large piece of *Cryſtal* containing a good quantity of water in the centre. The Stone called *Amianthus* in *Cyprus*. Great tranſparent Stones found near *Tauris*, wherewith they adorn their Houſes: and in which ſometimes Animals, as in *Amber*. With a great number of particulars more, reducible to the Claſſes above ſpecified.

The Second Part conſiſts of 3 Books, whereto is premiſed a diſcourſe

of

of Coyns currant over all *Asia*, being *Gold*, *Silver*, *Copper*, several sorts of *Shells* & *Almonds*: of all which he gives the descriptions, value, & figures.

The *first* Book contains the descriptions of 11 or 12 great Roads from *Ispahan* and *Gehanabat* (where the Great *Mogul* resides,) and to divers other considerable places in the *Indies*.

The 2*d* Book is the History of the Empire & Court of the G. *Mogul*.

The *third* Book, an Account of the Religion of the *Mahometan Indians*. Of the *Faquirs*, and their Penances. Of the Idolatrous *Indians*, and their *Pagods*, *Pilgrimages*, Burning the Women with their deceased Husbands; and divers other Customes.

In these Books there are many things observable, both *Natural*, *Moral* and *Civil*, like to those above-mention'd out of the *first* Part: As of their *Custome-Houses* and *Customes*, *Exchange*, *Weights*, *Measures*, *&c.* Descriptions of *Gehanabad*, *Amadabat*, *Baroche*, and the *Mountebanks* there; *Cambaya*, *Bengala*, *Bantam*, *Goa*, and the famous Hospital there; *Cape of good Hope*, who cut out the right Testicles of all their Males. Of *Boutan*, the wonderful reverence the people have for their King. Of the *Bramins* and *Camocks*. The people of *Saba*, who never live above 40 years. The *Bannians*, who never kill any thing. Kingdom of *Eipra*, where the people have oftentimes great *Wens* under their Throats, especially the Women. Of *Asem*, *Siam*, and *Golconda*, *Macassar* & their Poysons. *Borneo*, govern'd not by Kings, but Queens.

He telis from whence *Musk*, *Bezoar*, with other medicinal Stones of Animals; the best *Ivory*. How they whiten *Silk*; whence the best painted *Calico's*, and how whiten'd. Whence *Cinamon*, the best *Cardamoms*, *Pepper*, *Indigo*, *Opium*, *Gum-Lak*, *Wormseed*, *Cassia fistularis*, *Ambergreese*, *Coral*, *Agats*, *Borax*, *Salt Armoniack*, *Salt Peter*. *&c.* and the cheats used about them, &c.

He informs us how *Lions* are tam'd; how *Elephants* taken, &c. Of the *hooded Serpent* of *Melinde*; of *Siam* with 2 heads, &c.

How long since, and by whom *Coffee* brought into use. *Nutmeg-Tree* never planted. An *Emetick Root*, which the *Augans* use. *Tari*, the sweet juyce of a Tree. A *purging Sorrel* at St. *Helins*. At *Navapoura*, a pure white *Rice* having the smell of *Musk*. The *Cinamon-Tree* describ'd, &c

Of the *Diamond* Mine; whereof there are 4 describ'd. The places, ground, manner of working, &c. The Weights, Money, and Rules to prize the *Stones*, used at the Mines.

Of *Pearls*, how bred; as also how, and where fished for, &c.

To these Two Parts are added, his Relation of the Inner part of the Grand *Scignor's Seraglio*; never before expos'd to publick view.

To which is subjoyn'd *(by another Hand)* a short description of all the Kingdoms which encompass the *Euxine* and *Caspian* Seas; delivered by the Author after above 20 years Travel. Together with a Preface containing several remarkable Observations of the aboveſaid Countries.

IMPRIMATUR,

Jonas Moore, R.S. Vice-Præses.

London, *Printed for* John Martyn, *Printer to the R. Society*, 1678.

PHILOSOPHICAL TRANSACTIONS.

March 25.
For the Month of *March*, 1678.

The Contents.

A Relation of the Culture, or Planting and Ordering of Saffron; *by the Honourable* Charles Howard, *Esquire.* *An Account of the* Tin-*Mines in* Cornwall; *by Dr.* Christopher Merret. *Experiments of the Refining of* Gold *with* Antimony; *by Dr.* Jonathan Goddard. *A Relation of a monstrous Birth*; *by Dr.* S. Morris *of* Petworth. *An Account of three Books:* I. *The Royal* Pharmacopæa; *by* Moses Charras, *the* (French) *Kings Chief Operator in his Royal Garden of Plants.* II. Decameron Physiologicum; *by* Thomas Hobbes *of* Malmsbury. III. *An Account of Mr.* Joseph Moxon's *Undertaking and Essays, in the History of Handy crafts.*

An Account of the Culture, or Planting and Ordering of Saffron; *by the Honourable* Charles Howard, *Esquire.*

Saffron-heads planted in a black rich Sandy Mold, or in a mixt Sandy Land, between white and red, yields the greater store of *Saffron.*

A Clay or Stiff-ground, be it never so rich, produceth little *Saffron*; though increase of Heads or Roots, if the Winter prove mild and dry: but the extremity of cold and moisture will rot them. So that the finest light Sandy Mold, of an indifferent fatness is esteemed most profitable.

Plough the Ground in the beginning of *April*, and lay it very ſmooth and level.

About three weeks or a month after, ſpread upon every Acre twenty Loads of rotten Dung, and plough it in.

At *Midſomer* plough it again, and plant the *Saffron*-heads in rows, every way, three Inches diſtant one from another, and three Inches deep.

The moſt expedite way of planting, is to make a Trench the whole length of the Field, three Inches deep with a Spit-ſhovel.

The Spit-ſhovel is to be made of a thin ſtreight Iron ten Inches long, and five Inches broad, with a Socket in the ſide of it to put a ſtaff or handle. Lay the *Saffron*-heads three Inches diſtant in the Trench, and with the Shovel ſpit up three inches of Earth upon them.

Obſerve this order in planting of whole Fields, whereby the Heads will lie every way three inches ſquare one from another. Only Paths or ſhallow Trenches are to be left two or three yards aſunder, which ſerve every year to lay the Weeds to rot, that are to be weeded and pared off the ground.

As ſoon as the Heads begin to ſhoot or ſpeer within the ground (which is uſually a fortnight before *Michaelmas*) howe or pare the ground all over very thin: and rake lightly all the Weeds and Graſs very clean, leſt it choak the Flowers, which will ſoon after appear; and are then to be gather'd, and the *Saffron* to be picked and dried for uſe.

The Ground muſt be very carefully fenced from Sheep or Cattel, which by treading break the *Saffron*-graſs, and make the chives come up ſmall.

In *May* the *Saffron*-graſs will be quite withered away, after which, the Weeds and Graſs the ground produceth may be cut or mowed off from time to time to feed Cattel till about *Michaelmas*, at which time the Heads will begin to ſpeer within the ground.

Then howe, pare and rake the Ground clean, as before, for a ſecond crop. The like directions are to be obſerved the next year for a third crop.

The

The *Midſomer* following dig up all the *Saffron* heads, and plant them again in another new Ground (dunged and ordered as aforeſaid) wherein no *Saffron* hath been planted, at leaſt not within ſeven years.

The Flowers are to be gathered as ſoon as they come up, before they are full blown, whether wet or dry.

Pick out the chives clean from the ſhells or flowers, and ſprinkle them two or three fingers thick, very equally, on a double *Saffron*-paper. Lay this on the Hair-cloth of the *Saffron*-Kiln, and cover it with two or more *Saffron*-papers, a piece of Woolen-cloth or thick Bays, and a Cuſhion of Canvas or Sack-cloth filled with Barley-ſtraw, whereon lay the Kiln-board.

Put into the Kiln clean, throughly kindled Char-coal, Oven-coals, or the like, keeping it ſo hot that you can hardly endure your fingers between the Paper and the Hair-cloth.

After an hour or more turn in the edges of the cake with a Knife, and looſen it from the paper. If it ſtick faſt, wet the outſide of the paper with a feather dip'd in Beer, and then dry the papers. Turn the cake, that both ſides may be of a colour.

If it ſtick again to the paper looſen it, and then dry it with a very gentle heat, with the addition of a quarter of 100 *l.* weight laid upon the Kiln-board.

The *Saffron*-cake being ſufficiently dry'd is fit for uſe, and will laſt good many years, being wrapt up and kept cloſe.

The beſt *Saffron* is, that which conſiſts of the thickeſt and ſhorteſt chives, of a high-red and ſhining colour, both without and within alike.

Saffron is oftentimes burnt, and in knots, ſpotted and mixed with the yellows that are within the ſhells.

It's uſually obſerv'd, that one Acre doth yield, at the leaſt, 12 pounds of good *Saffron* one year with another, and ſome years 20 pounds.

Good *Saffron* is ſeldom or never ſold at ſo low a rate as 30 ſhillings *per* pound, frequently at three pounds *per* pound, and upward. Wherefore one Acre bearing 12 pounds at 40 ſhillings the pound, cometh to 24 pounds *per annum*.

The gathering and picking of one pound of *Saffron* is worth one ſhilling, which cometh to twelve ſhillings *per* Acre.

The Fire and care of drying may come to 3 ſhillings more, at 6 pence the pound; which is in all 15 ſhillings.

The Graſs that is mowed and cut off the ground for the uſe of Cattel, will be very near worth as much as will countervail the picking and drying the *Saffron*; the Soyl being inrich'd not only by the Dung, but the *Saffron* it ſelf, as appears by the rich crops the ground yields for ſeveral years after without any other manuring or improvement.

Sixteen Quarters of *Saffron* heads are ſufficient to plant one Acre. A Quarter of theſe Heads is uſually ſold in the place for 10 ſhillings, which comes to 8 pounds *per* Acre.

Twenty Loads of rotten Dung laid on the ground, may be worth 40 ſhillings at 12 pence a Load for the Dung, and as much for carriage into the Field.

For thrice ploughing the ground 20 ſhillings.

For planting the Heads about 4 pounds. Which in the whole makes 14 pounds, the charges of planting an Acre, which will bear three crops.

So that all things reaſonably computed it appears, that an Acre of *Saffron* will be worth, notwithſtanding all caſualties, one year with another, over and above the 14 pounds charges, for the firſt years planting (at the leaſt) 20 pounds *per annum*. Beſides the great increaſe of the *Saffron* heads, which will be as three for one.

The Kiln.

It conſiſts of an Oaken-Frame, lathed on every ſide, twelve inches ſquare in the bottom, two foot high, and two foot ſquare at the top; upon which is nailed a Hair-cloth, and ſtrained hard by wedges drove into the ſides; a ſquare Board and a Weight to preſs it down, weighing about a quarter of a hundred.

The inſides of the Kiln cover'd all over with the ſtrongeſt Potters-clay, very well wrought with a little Sand, a little above two inches thick.

The

The bottom muſt be lined with Clay four or five inches thick, which is the Hearth to lay the fire on: level wherewith is to be made a little hole to put the Fire. The outſide may be plaiſter'd all over with Lime and Hair.

A Relation of the Tinn-*Mines, and working of* Tinn *in the County of* Cornwal ; *by Dr.* Chriſtopher Merret.

THe Stones from which *Tinn* is wrought are ſometimes found a foot or two below the ſurface of the Earth, but moſt uſually betwixt two walls of Rocks (which are commonly of an Iron-colour, of little or no affinity with the *Tinn*) in a Vein or Load (as the Miners call it) betwixt 4 and 18 Inches broad, or thereabout.

Some ſay, the Load runs North and South: but in truth it runs Eaſt and Weſt, and all other ways with very great variety.

Sometimes there is a rich and fat Metal; ſometimes hungry and ſtarved; ſometimes nothing but a droſſie ſubſtance, not purely Earth, nor Stone, nor Metal; but a little reſembling the rejected Cynders of a Smiths Forge: appearing ſometimes of a more flouriſhing colour tending to Carnation; and ſometimes more umbratile: and where this is found, the Miners judge the Metal to be ripe.

The Pits are 40, 50, and ſometimes 60 Fathoms deep, and more.

The Load being very rich and good, above that is ten fathoms from the graſs, or thereabouts. And below that, there's a ſtrange cavity or empty place, wherein is nothing but Air for many fathoms deep, as the Miners have tried with long Poles and Pikes. This cavity lies between hard Stony walls, diſtant one from another about ſix or nine Inches. The Labourers tell ſtories of Sprights or ſmall People, as they call them: and that when the Damp ariſeth from the ſubterraneal Vaults, they hear ſtrange noiſes, horrid knockings, and fearful hammerings. Theſe Damps render many lame, and kill others outright, without any viſible hurt upon them.

The

Tinn, for the moſt part, is incorporated with the Stone, or is found in it. They break every individual Stone, and if there be any blackneſs in the Stones, they break out a Well, (in their terms) and of this black ſtuff produce their *Tinn*.

Though this Metal be, for the moſt part, made from the Stones; yet ſometimes it is as it were mixed with a ſmall gravelly Earth; ſometimes white, but for the moſt part red. From this Earth 'tis eaſily ſeparated with bare Waſhing; but from the Stone, not without much ſtamping.

This gravelly *Tinn* they diſtinguiſh from that which is gathered from the Stones, calling it *Pryan Tinn*; an hundred Loads whereof ſcarce equalizeth in value fifty of the other: although in different Loads there's great variety of goodneſs.

Another ſort of Ore they have, call'd *Mundick Ore*. Being mixed together, the *Mundick* may be eaſily known by its glittering, yet ſad brownneſs, wherewith it will ſoon colour your fingers.

The *Mundick* is ſaid to nouriſh the *Tinn*; and yet they ſay, where much *Mundick* is found, there's little or no *Tinn*; and where there is little or none of that, much and good *Tinn* is found. Certain it is, if there be any *Mundick* left in melting the *Tinn*, it doth it much prejudice, making it thick and cruddy, that is, not ſo ductile, as otherwiſe. For *Tinn* without it will eaſily bow and bend any way; but mixed with it becomes very brittle, and will crack and break. And therefore, uſually draws down the Metal to an abatement, from five ſhillings to eight ſhillings in the hundred pound weight.

This *Mundick* ſeems to be a kind of Sulphur. Fire only ſeparates it from the *Tinn*, and evaporates it into ſmoke. Little ſprigs or boughs ſet in the Chimney, the Smoke gathereth upon them into a ſubſtance which they call Poyſon, and think it is a kind of *Arſenick*; which being put into water eaſily diſſolves, and produces very good *Vitriol*.

The Water wherein it is diſſolved ſoon changeth ſmall Iron Rods put into it; and they ſay, that in a very little

little time, it will assimilate the Rods into its own nature.

'Tis generally concluded, that Fish will die in those Waters whereinto *Mundick* is cast: and they commonly impute the death of some of their Neighbours to their drinking of *Mundick*-waters.

When they burn it, to separate it from the *Tinn*, there proceeds from it a stench very lothsom and dangerous.

Besides the fore-mentioned Stones, &c. found in *Tinn* Mines, and incorporated with the *Tinn*; there occurs a *Sparr* mixed also with this Metal, as it is commonly with *Lead* and *Copper*.

This appears frequently of a shiny whitish substance; (and therefore called, by some, *Mercury*) and casteth a white froth upon the Water in washing it. When first taken out of the Earth 'tis soft and fattish, but soon after grows somewhat hard. Is seldom found growing, but only sticking to the Metal. The Miners call it *White Sparr*; and some of them think it is the Mother or Nourisher of the Metal. But 'tis certain, that *Sparr* is often met with in Moorish grounds, where they never hope to find any Ore. Yet no *Tinn* Mines are without it.

The *Cornish Diamonds*, so call'd, lie intermix'd with the Ore, and sometimes on heaps: some whereof are big enough to have a Coat of Arms engraven on them; and are hard enough to cut Glass. Some of them are of a transparent Red, and have the lustre of a deep *Ruby*. These Diamonds seem to me to be but a finer, purer, and harder sort of *Sparr*; for they are both found together, as on St. *Vincents* Rocks near *Bristoll*.

Godolphin Ball is the most famous of all the Balls or Mines in *Cornwall*, for the quantity of Metal. Though some of late years pretend another Mine (which some call the *Silver* Mine, others, the *Lead* Mine) more rich than that. And about twelve years since, I saw an Assay made of some of that Ore, as 'twas said, brought from thence; whereof ten pound weight yielded two ounces and quarter of fine Silver.

The Agents keep the Countrey in great ignorance concerning this Mine. But the difference of other Mines, except

except in the *Pryan* and *Mundick Tinn*, is but little.

The beſt Ore is that which is in Sparks; and next to this, that which hath bright *Sparr* in it.

As for the Working of the Ore, 'tis thus performed: The Stones beaten as before, are brought to a Mill call'd the Stamping-Mill, which goeth by Water, with ſuch Stampers as Paper-Mills have. The Stones are ſo diſpoſed, as that, by degrees, they are waſhed into a *Lattin* Box with holes, into which the Stampers fall: by which means they are beaten pretty ſmall, and by the Water continually paſſing through the Box, the Ore, through its weight, falls cloſe by the Mill, and the parts not Metalline, which they call Cauſalty, are waſhed away by the Water. And thus the firſt ſeparation is made.

Then they take that which falls cloſe by the Mill, and ſo diſpoſe it in the ſaid Mill, that the Water may once more drive it, to make a better ſeparation of the Cauſalty.

Next, they dry it in a Furnace on Iron-plates, and then grind it very fine in a Craſing-Mill, with Stones common in the Hills of that Countrey.

After this they re-waſh it, as before, and then dry it a little, and carry it laſt of all thus fitted to the Furnace, call'd by them a Blowing-Houſe, and there melt and caſt it.

There ſwims on the Metal, when it runs out of the Furnace, a Scum, which they call Droſs; much like to Sclag or Droſs of Iron; which being melted down with freſh Ore, runneth into Mettal.

The Cauſalty they throw in heaps upon Banks, which in ſix or ſeven years they fetch over again, and make worth their labour. But they obſerve, that in leſs time it will not afford Metal worth the pains; and at the preſent none at all.

Experiments

Experiments of Refining Gold *with* Antimony; *made by Dr.* Jonathan Goddard.

The First with several parcels of fresh Antimony.

THere was taken of Crown-*Gold* (which is, as they call it, of 22 *keratts* fine, or $\frac{11}{12}$; and the Alloy is part *Silver*, part *Copper*, more of the *Copper* for the most part) to the quantity of 7 *peny weight* and 10 *grains*, *i. e.* 178 *grains*. This was melted down with two ounces and two drachms of *Antimony* (about six times as much as the Gold.) And because the *Gold* was put in plates, for the more certain melting and mixture; the first *regulus* of *Gold* being separated from the *Antimony*, both were powdered apart, and the *regulus* in the Melting-Pot laid upon the same *Antimony*, and so both melted down again. In both which meltings such an heat was given, as made all of a clear light, even red heat, and boiling. Then the Pot was taken out of the fire, and all permitted to separate, settle, and cool in it. Upon breaking the Pot the *regulus* of *Gold* (being very distinct in the bottom, and easily separated from the *Antimony*) weighed 6 *peny weight* and 19 *grains* (163 *grains*.)

N.B. That this way of cooling all in the Pots was observed in all the following Experiments, for the more certain separation and settlement of the *Regulus*, without effusion into the *Antimony*-Horn (as they call it) or hollow Iron-Cone. Which effusion, by confounding and cooling the mixture, may be some hinderance to a more perfect separation. And to be sure, in the bottom of the Cone there is always a thin crust of the crude *Antimony*, troublesom to be separated, without taking off some part of the *Regulus*.

Note also, That *Borax* was used in every Pot, for prevention of the sticking of the *Regulus* to the bottom, and the *Antimony* to the sides of it; so that both were gotten off clean and in full quantity.

Of the *Regulus* a piece was broken off, which weighed 1 *peny weight* 14 *grains* and an half ($38\frac{1}{2}$ *grains*,) and was kept to be refined upon the Copel apart. The weight of the Remainder was therefore 5 *peny weight* 4 *grains* and an half ($124\frac{1}{2}$ *grains*.)

This Remainder being powder'd and put upon equal quantity of freſh *Antimony*, as at firſt, (*i.e.* two ounces and a quarter) and melted down, the *Regulus* weighed 3 *peny weight* and 2 *grains*, (74 *grains*).

The other Piece of 1 *peny weight* 14 *grains* and half, being refined on a Copel from the *Antimonial* ſubſtance mixed with it (by exhalation, promoted ſometime with a blaſt upon it, eſpecially toward the latter end, as in all the following Experiments of Refining upon the Copel) weighed 1 *peny weight* 6 *grains* and half ($30\frac{1}{2}$ *grains*:) and upon melting with *Borax* in a Crucible, loſt not above half a *grain*. So that the weight of the whole to the Gold it held, was as $38\frac{1}{2}$ to $30\frac{1}{2}$, or the Gold almoſt $\frac{4}{5}$ of the whole.

The latter *Regulus* weighing 3 *peny weight* and 2 *grains*, (*i.e.* 74 *grains*) being Refined in the ſame manner, weighed 2 *peny weight* and 15 *grains*, (*i. e.* 63 *grains*:) the *Gold* holding proportion to the whole, as 63 to 74, that is near upon $\frac{6}{7}$ of the whole. So that the ſame *Regulus* of *Gold* and *Antimony*, in paſſing through new *Antimony*, though it loſe much in weight, yet there is not a proportionable loſs of *Gold*: but is richer in *Gold*, as is proved by this and many other Trials; and ſo appears to ſenſe, being of a redder complexion, more tough and harder to powder.

Both the parcels of *Antimony* being ſaved for ſeparating the *Gold* remaining behind in them; they were ſeverally mixed with equal weight both of *Tartar* and *Nitre*, and then fired, and ſo reduced to a *Regulus*. Then the *Regulus* of each, exhaled and blown off upon Copels. Of the firſt parcel of *Antimony*, wherewith the *Gold* was firſt melted, the *Regulus* being exhaled, there remained in *Gold* 1 *peny weight* 12 *grains* (36 *grains*.) Which upon melting in a Crucible loſt ſomewhat, but ſcarce half a *grain*.

Of

Of the ſecond parcel of *Antimony*, wherewith the firſt *Regulus* of *Gold* and *Antimony* (weighing 5 *peny weight* 4½ *grains*) was melted, there remained in *Gold* 1 *peny weight* 3 *grains*, (27 *grains*.)

All the other parcels were fine *Gold* to ſenſe, upon the Touch. Only that out of the firſt *Antimony*, was apparently unfine and pale, from the *Silver* in the original Alloy mixed with it, and not from any remainder of *Antimony*; as appeared by the inconſiderable waſte upon melting in a great heat with a blaſt upon it: And alſo by the Toughneſs and Malleability: and by comparing it, on the Touch-ſtone, with Sovereign-*Gold* allayed with *Silver*, to which it did agree, but was ſomewhat paler; holding, to the judgment of ſenſe, about a fourth part of *Silver*, as the Sovereign-*Gold* doth a ſixth. Neither was it altogether free from *Copper*; becauſe, upon Nealing, it always turned black on the ſurface.

But for more exact diſcovery, it was taken and firſt Refined with *Lead* upon a Copel, for ſeparation of any *Copper* that might be in it. Upon which operation, it came forth 1 *peny weight* 9½ *grains* (33½ *grains*;) which was 2½ *grains* leſs than it was before. Afterwards this laſt was melted with betwixt two and three parts of *Silver*, and ſo wrought in *Aqua fortis* for ſeparation of the *Silver*: and there remained in *Gold* 1 *peny weight*, 4½ *grains* (28½ *grains*) which was five *grains* ſhort of the former. And yet it appeared, upon the Touch, not fine, but paler than Fine-*Gold*, and deeper than Crown-*Gold* allayed with *Silver*. So that what remained in it was neceſſarily of *Silver*; and it might be eſtimated about 23 *keratts* fine; or to hold in fine *Gold* about 27 *grains*.

What loſs of *Gold* was upon this Refining with *Antimony*, may eaſily be computed. Firſt, one twelfth is to be deducted from the firſt quantity of Crown-*Gold*, being 7 *peny weight* and 10 *grains*, (178 *grains*) for Alloy; which is 14 *grains* and ⅙. So the remainder is, 6 *peny weight*, 19 *grains* and ⅚, or 163½ *grains*.

Then the ſeveral parcels of Fine-*Gold* recovered and ſeparated from the *Regulus* of *Antimony* and *Gold*, and alſo from the parcels of the crude *Antimony* reduced to *Regulus* are to be added together: that is to ſay, 1 *peny weight* 6 *grains*, 2 *peny weight* 15 *grains*, 1 *peny weight* 3 *grains*, and 1 *peny weight* 3 *grains* (the 27 *grains* laſt mentioned:) All which amount to 6 *peny weight* 3 *grains*. Which being deducted from the firſt quantity of 6 *peny weight* 19 *grains*, the difference is 16 *grains*, which is 1 tenth and 3 ſixteenths of one tenth.

For a more particular eſtimate, where and how this loſs of *Gold* ariſeth, it appeareth, that the parcel of *Antimony* wherein the *Gold* was firſt melted, is to be charged with 163 $\frac{1}{16}$ *grains* of fine *Gold*. Toward which, the firſt *Regulus* weighing 6 *peny weight* 19 *grains*, (163 *grains*) (in proportion to that piece of the ſame, weighing 1 *peny weight* 14 *grains* and half, and producing, upon refining on the Copel, 1 *peny weight* and 6 *grains* of pure *Gold*) muſt hold 128 *grains* of fine *Gold*. Then 1 *peny weight* and 3 *grains* (27 *grains*) of fine *Gold*, eſtimated to be contained in the 1 *peny weight* and 12 *grains*, ſeparated from this parcel of *Antimony*, and refined both by the Copel and Parting-water (as in the former account given hereof) being added to the 128 *grains*, makes 155 *grains*: which is ſhort of 163 *grains*, by 8 *grains*; and ſo much was irrecoverably loſt in this parcel of *Antimony*.

The piece of *Regulus* weighing 5 *peny weight* and 4 *grains*, (or 124 *grains*) melted with the ſecond parcel of *Antimony* (in proportion to the former piece broke off, weighing 38 *grains*, and upon refining yielding 30 *grains* of pure *Gold*) muſt contain 98 *grains* of the like *Gold*, and ſo much this ſecond parcel of *Antimony* muſt be charged with. Toward which, the *Regulus* weighing 3 *peny weight* and 2 *grains*, being refined, produced 2 *peny weight* and 15 *grains* (63 *grains*). And that *Gold* ſeparated from the ſame *Antimony*, being 1 *peny weight* and 3 *grains*, (27 *grains*) added to the former, make 90 *grains*: ſhort of the firſt quantity charged on this parcel of *Antimony* by 8 *grains*.

Some

Some loſs of *Gold* may be upon powdering of the *Regulus* (rich in *Gold*) in an Iron-Morter, (for the more certain mixture with the *Antimony* than if it were put in in lumps) as alſo by the papers neceſſarily uſed. But it is moſt probable, that the greateſt loſs was by ſmall ſparks, which continually fly up while the *Antimony* is in a boyling heat with the *Gold*; which is always given it for the better ſatisfaction concerning the through melting and mixture. Theſe Sparks appear heavy, by their riſing not very high, and moſt of them falling down again upon the Metal and within the Pot: but many fly over into the fire.

Theſe Sparks appear to be *Gold* thus: When the Pot was covered with a plain ſmooth Earthen-cover, ſo that many of them, upon appulſe, did ſtick to it, and colour'd it of a deep-Red; *Aq. fortis* was firſt poured on, which did not diſſolve or fetch off any thing: after *Aq. Regia*, which did plainly work upon that ſubſtance, and ran off yellow, like a ſolution of *Gold* in the ſame Water.

It is not improbable alſo, that ſome loſs of *Gold* may be upon the firing of the *Antimony* (after the ſeparation of the *Golden Regulus*) for reducing it to a *Regulus* with *Tartar* and *Nitre*, which make a vehement conflagration with abundant ſparkling.

It hath been ſuſpected, that ſomewhat of the *Gold* may be diſſipated by the blaſt upon the Copels in refining it from the *Antimony* remaining in it. But this is not ſo probable; becauſe *Gold* hath been melted ſeveral times with a greater proportion of *Regulus* of *Antimony* Simple, than is contained in the *Golden Regulus*, and refined from it with the greateſt heat and blaſt that could be given, without any loſs. And it is the conſtant practice of ſome Refiners, who to give their Fine-*Gold* a higher colour for Gilding, to put to it one third or fourth part of crude *Antimony*, or of *Regulus* of *Antimony*, and with a great heat and ſtrong blaſt work it off; in which operation, in ſome Ounces of *Gold*, they loſe not one Grain.

The

The Second Experiment of repeating the Operation with the same Antimony.

There was taken of Crown-*Gold* to the weight of 5 *peny weight* 21½ *grains*. Which was melted with one *ounce* and ¼ (about a ſixfold proportion) of *Antimony*. The *Regulus* weighed 5 *peny weight* and 3 *gr*.

From this, a piece weighing 1 *peny weight* and 6 *grains*, broken off and reſerved for refining by it ſelf; the remainder, being 3 *peny weight* and 21 *grains*, was melted down again with the ſame *Antimony*, being powdered and put on the top: and thereupon the *Regulus* came forth, weighing 3 *peny weight* and 19 *grains*: ſo that here was no conſiderable loſs. And there is ground to ſuſpect, that it might be upon ſome accidental difference in the managing, that the *Regulus* did not ſo perfectly ſeparate and ſettle: For in all other Experiments of melting the ſame *Regulus* again with the ſame *Antimony*, the *Regulus* gained weight; as in the next following.

From this ſecond *Regulus*, a piece broken off and reſerved for refining apart, weighing 1 *peny weight* and 12 *gr*. the remainder being 2 *peny weight* 7 *grains*, was melted down, as the former, and in the ſame *Antimony*. Whereupon the *Regulus* came forth in weight 3 *peny weight*; 17 *grains* being here gained to 55 *grains*, making the whole 72 *grains*, *i.e.* between ¼ and ⅓.

The firſt piece of 1 *peny weight* and 6 *grains*, being refined upon the Copel, produced of Fine-*Gold* 1 *p. weight* juſt: which holds in proportion as 24 to 30. So that it contained four fifths of *Gold*, and but one fifth of *Antimonial* ſubſtance in it.

The ſecond piece weighing 1 *p. w.* and 12 *gr*. being refined upon the Copel, produced of fine *Gold* 1 *p. w.* and 4 *gr*. in proportion of 28 to 36, which is rather leſs than four fifths, as in the former; but the difference is inconſiderable for quantity.

The

The *Regulus*, upon the third melting, weighing 3 *peny weight*, refined upon the Copel, produced of fine *Gold* 2 *peny weight* and 7 *grains*. This holds in the proportion of four fifths: but somewhat short of the next before.

Upon these comparisons, in this Experiment of repeating the melting of the *Regulus* with the same *Antimony*, the *Regulus* gaineth weight each time, but is in proportion less rich in *Gold*: both which are contrary, in repeating the melting of the *Regulus* with fresh *Antimony*, as in the former Experiments.

The remaining *Antimony* being reduced to a *Regulus* by firing with *Nitre* and *Tartar*, of each equal weight to it self, and that *Regulus* exhaled upon the Copel, there remained of *Gold* 19 *grains*. This was less fine than that fetched out of the first *Antimony*, in the former Experiment of passing *Gold* through several parcels of *Antimony*; though losing little sensible in weight, upon melting with a strong heat and blast upon it. So that the impurity was not from any remaining *Antimonial* substance in it; but from the *Silver* and *Copper* mixed with it in the first Alloy. And these were esteemed to be about a third part, by the judgment of the eye upon the Touch-stone. And so proved upon refining; first with *Lead* upon the Copel, for fetching out the *Copper*; upon which it weighed 17 *grains* and half, *i. e.* one grain and half short of what it was before: and then with *Aq. fortis*, after the melting down with more than the double weight of *Silver*; upon which Operation there remained 15 *grains*, and that not perfect fine, but retaining somewhat of *Silver*; but finer than Crown-*Gold* allay'd with *Silver*; upon the Touch, about twenty three *keratts*.

For computing the loss of *Gold* upon this refining from the first quantity, *videlicet*, 5 *peny weight* 21 *grains* and half, a Twelfth part, (which is 12 *grains*, save, about one sixth of a grain) being deducted for Alloy, the remainder is 5 *peny weight* 9½ *grains*, and $\frac{1}{6}$. And the several parcels of fine *Gold* produced of the *Regulus*, according to the account

count given in particular, added together; *vid.* 1 *peny weight*, 1 *peny weight* and 4 *grains*, 2 *peny weight* and 7 *grains*, and about 12 *grains* of fine *Gold* reckoned for the 19 *grains* of impure recovered out of the *Antimony*; all together make 4 *peny weight* and 23 *grains*: short of the 5 *peny weight* and 9 *grains*, by about 10 *grains*; *i.e.* as 10 to 129, or very near one thirteenth.

The Third Experiment of exhaling the whole Antimony.

A parcel of Crown-*Gold*, weighing 3 *peny weight* 10 *gr.* and half, was melted down with an ounce of *Antimony* (about the proportion of six to one); and the *Antimony* was exhaled in the Crucible to a *Regulus*. Then the *Antimonial* part of that *Regulus* was exhaled on a Copel. Whereupon there remained 3 *peny weight* and 12 *grains*: which was more than the first *Gold* by $1\frac{1}{2}$ *grain*. This must happen, for want of a heat strong enough at last to force off all the *Antimonial* substance. Whence afterward, upon melting in a Crucible, it came short 4 *grains*; *vid.* 3 *peny weight* 8 *grains*, which was but $2\frac{1}{2}$ grains short of the first quantity, and is the least part of the proportion of *Copper* that must be in it, according to the usual Alloy of Crown-*Gold*: which is generally two parts to one of *Silver*, or at least the half.

So that *Antimony* in a far greater proportion, doth not so much, as *Lead*, in exhaling or separating *Copper* from *Gold*; if the work be done meerly by Exhalation: but doth only retain it with it self, whilst the *Gold* separates and settles in a *Regulus* at the bottom. Neither is it so destroyed, but that it may, in part at least, be united to the *Gold* again.

That

That there remained *Copper* in this *Gold*, appeared farther by the black complexion of it upon Nealing. As alſo by the loſs upon working it with *Lead* on a Copel: whereupon it came forth 3 *peny weight* 4 *grains*, *i. e.* four grains ſhort.

A Relation of a Monſtrous Birth, made by Dr. S. Morris *of* Petworth *in* Suſſex, *from his own obſervation: and by him ſent to Dr.* Charles Goodall *of* London; *both of the Colledge of Phyſicians*, London.

AT *Petworth*, *Decemb.* 20. 1677. one *Joan Peto*, a Butchers Wife, after moſt acute pains was by her Midwife delivered of a monſtrous Female Birth.

It had two Heads. Both the Faces very well ſhap'd. The left Face looked Swarthy: and never breathed. And the left Head was the bigger; and ſtayed longer in the Bearing. The right Head was perceived to breath; but not heard to cry. Betwixt the Heads was a protuberance, like another Shoulder. The Breaſt (and Clavicles) very large; about ſeven Inches broad. But two Hands. And but two Feet. *Paræus* hath a Figure anſwerable to this Deſcription, excepting the Protuberance above-ſaid.

As to the Inwards: the Brain, in each Head, was very large. The *Spina Dorſi*, from the Neck to the Loyns, was double. There were alſo two Hearts, one on each ſide the *Thorax*. The left Heart the bigger. And two pair of Lungs; one infolding each Heart. Thoſe in the left ſide were blackiſh; the other looked well. The *Mediaſtinum* parted the two Hearts one from the other.

The *Aorta* and *Vena Cava*, below the Diaphragm, ſingle: the Diaphragm having only three perforations, as is uſual. But a little above it they were each divided into two Branches, diſtributed to the two Hearts in the figure of a

Greek Y. The *Oesophagus*, in like manner, a little above the Diaphragm, *scil.* about the fifth *Vertebra* was divided into two Branches, one ascending up into each Throat.

There were also two Stomachs or *Ventriculi*. One shaped, as in a Natural Birth. The other, a kind of great Bag, bigger than the Natural Ventricle. In which respect it answered to the Panch in a Cow or Sheep: but, in regard of its place, rather to the *Reticulus*, or else to the *Abomasum*; being at the one Orifice continuous with the true *Pylorus*, and at the other with the *Duodenum*. Within it was contain'd a substance like *Meconium*, as is usual in Children newly born.

The Liver, but one; but very great: and the *Cystis fellea* proportionable. The Spleen also, one; but large. So were the Intestines; and all the parts of the lower Ventricle; especially the left Kidney. The *Uterus* of an usual bigness; but the *Clitoris* large.

The Secundine extraordinary great, weighing about eight pounds.

An

An Account of Three Books.

I. *The* Royal Pharmacopæa, Galeno-Chymical, *according to the Practiſe of the moſt eminent and learned Phyſitians of* France, *and publiſhed with their ſeveral approbations. By* Moſes Charras, *the Kings chief Operator in his Royal Garden of Plants. In* Engliſh.

THe diligent and Ingenious Anthor having ſome years ſince received Order and Directions from Monſieur *Anthony d'Aquine*, primary Phyſician to the *French* King, for compoſing a *Galeno-Chymical Pharmacopæa*: his Induſtrious purſuance of the ſame from year to year, hath at length produced this Work. The greater part of the Contents whereof, although well known to moſt learned Phyſicians; yet becauſe there are alſo amongſt them many uncommon Experiments, and all made with great accurateneſs, and deliver'd with equal perſpicuity: it doth therefore very well deſerve the following account.

It is divided into Four Parts. The firſt is of *Pharmacy* in general. As of the Names and Principles of Chymical Pharmacy. The choice and preparation of Medicines, as Lotion, Purgation, Trituration, Cribration, Infuſion, Humectation and Immerſion, Nutrition, Diſſolution, Fermentation, Digeſtion, Circulation, Cohobation, and the reſt. Together with the ſeveral degrees of Fire, and kinds of Furnaces, Lutes, Veſſels, &c.

The Second Part treateth of *Galenical* Preparations and Compoſitions, in two Books. In the firſt, of Internals; as Juices, Infuſions and Decoctions, Julaps, Apozemes, Emulſions, Potions, Gargariſms, and the reſt. In the ſecond Book, of Externals, as Oils by Expreſſion, Infuſion and Decoction, Balſams, Embalming of dead Bodies, &c.

The Third Part treateth of Chymical Preparations, in three Books. In the firſt, of Vegetals. And firſt of Deſtillation, as of Roots, of moiſt and cold Herbs, of bitter

Herbs, of Antiſcorbuticks, of Flowers, Odoriferous Waters, Ardent Spirits, Seeds, Berries, Grains and Pulſe; Woods, Soot, Wine, Spirit of Wine (where alſo of Spirit of Wine Tartariz'd) of Tartar, Vinegar, Sugar, Manna and Gums. Then of Tinctures, Elixirs, Extracts, Reſins, Salts, Tartar cryſtalliz'd, Chalybiate, Emetick, Vitrioliz'd, Foliated; of Volatile Salt of Tartar, and of Sal Volatile Oleoſum. In the ſecond Book, of Animal Preparations. As of Humane Skull, Blood and Urine; Of Vipers, Harts-Horn, Toads, Frogs, River Crabs, Storks, Honey, Wax, and Earthworms, Cantharides, Ants, the Peacock and Caſtor. In the third, of Mineral Preparations; as of Earths and Boles, Waters, Lime, Lapidis *Judaici*, Lincis, of the Blood-ſtone, Cryſtal, Coral, Pearls, Talk, Common and Sea-Salt, dulcify'd Spirit of Salt, Nitre, Sal Polychreſtes, Spirit of Nitre, Aqua fortis, Aqua Regia, Alum, Salt Armoniack, the Urinous Spirit of Salt Armoniack, the acid Spirit, Vitriol, Monſieur *la Faveur's* Stiptick Water, Sulphur of Vitriol, dulcify'd Spirit of Vitriol, Salt of Vitriol; Sulphur, Lac Sulphuris, Spirit and Salt of Sulphur, Arſenick, Ambergreeſe, Amber. Of Metals, as ſeveral ways of calcining and refining of Gold; and of its Tinctures. Refining, Cryſtals, and Tincture of Silver. The Infernal Stone. Crocus, Sal, *& Tinctura Martis*, *Vitriolum & Spiritus Veneris*. *Saccharum*, *Spiritus & Balſamus Saturni*. *Flores Jovis*, *Bezoardicum Joviale*, *&c.* The Cinaber, and ſeveral Precipitates and Sublimates of *Mercury*, *&c.* The Icy Liquor, Emetick Powder, Philoſophick Spirit, and other preparations of *Antimony*.

The Fourth Part contains ſeveral particular Receipts, taken out of good Authors, with others communicated by divers Learned Perſons.

The Work is illuſtrated by ſeveral Copper Plates.

II. Decameron Physiologicum: *Or, Ten Dialogues of Natural Philosophy. To which is added (they are the Authors words) the proportion of a streight Line, equal to half the Arch of a Quadrant.* By Thomas Hobbs of Malmsbury.

I Am not more certain of the Authors being a learned Man, than I am of his mistakes in several Particulars of this Book. Yet my business is not here to dispute it, but to give a just account of it, which is as follows.

The first Dialogue is of the Original of Natural Philosophy; which (from the Authority of *Diodorus Siculus*) he ascribes to the Astronomers of *Æthiopia*: Many of whose Posterity (their only Disciples) were transplanted into *Ægypt*, (whence *Pythagoras*, &c. fetched their Philosophy into *Greece*) and *Assyria*, and were by the *Hebrews* there called *Chaldies*, or *Chaldim*, corruptly, as he conjectures, from *Chuldim*, as that from *Chusdim*, as being a Race of *Æthiopians*; for *Æthiopia* and the Land of *Chus* are the same. But he conceives, That the first Studiers of Natural Philosophy commonly so called, were the *Greeks*: That the several Sects hereof were the occasion of Heresies in the Primitive Church; And this and the Scriptures together of the School-men. Whereto he subjoyns his thoughts of the nature of Body, defineing it, a thing that hath Being in it self without the help of Sense.

The second is of the Principles and Method of Natural Philosophy: Wherein he neglecteth all Causes, but Motion, the universal Efficient. This he defines to be, Change of Place. Place to be, the space wherein a Body is contain'd; or, The Image of a Body. Time, the Image of Motion. To which he subjoyneth some Propositions.

The Third is of *Vacuum*, which he denyeth from several, by him supposed Arguments. Asserteth, That the space above the *Mercury* in the *Barometre*, is fill'd with Air. And that in working upon the Pneumatick Engine, there is never any Air pumped out.

The fourth is, of the System of the World. Wherein he

he endeavours (chiefly from the Doctrine of *Copernicus*, *Kepler* and *Galileo*) to explicate the Cause of the motion of the Earth about the Sun, of the Moon about the Earth, and both about their own Centres. Why the Æquinoctial and Solstitial Points, are not always in the same point of the Ecliptick of the Fixt Stars. Noting, from the same Authors, that the Æquinoctial Points proceed from West to East, every Hundred years, one Degree or very near; which is 36000 years for one whole Revolution. And lastly, why the Distance betwixt the Æquinoctial and the Solstice is not always the same.

The fifth is, Of the Motions of Water and Air. Wherein he speaks his sense of Tides, and their variations; deducing them partly from the Motions both of the Earth and Moon; & partly from the situation of the Sea in respect of the Land. Of the Cause of Clouds, *&c.* Of Springs; noting a mistake of *Julius Scaliger* about a River in *Savoy*, and thence of the Original of Springs.

The sixth is, of the Causes and Effects of Heat and Cold: Where he speaks his opinion of the nature of Fire and Ice. The Inflammability of Gun-powder; of Thunder and Lightning; which, he saith, will not burn.

The seventh is, of Hard and Soft, and of the Atomes, that fly in the Air. Wherein he also speaks, what he thinks, of such Bodies as are generally conceived to be petrified: of Elasticity, and of contagious Air.

The eighth is, of Gravity and Gravitation: Wherein he positively denies, That Oyl poured upon Quicksilver in a bended Siphon (only in at one arm of the Siphon) will cause the Quicksilver in that Arm to descend. He doubts not, but that the *Species* of heavy, hard, opaque and Diaphanous, were all made so at the Creation. In the end, explains a Scheme shewing the Degrees of the Inclinatory Needle in passing from one Pole to another.

The ninth is, of the Loadstone and its Poles. Where, of the Magnetick Attraction: The Touching of Needles: The Variation of the Compass, and of that Variation: The rest is offer'd, as a Confutation of the Book called *Longitude found.*

Asserting,

Asserting, contrary to that Book, The Poles of the Earth, and the Magnetick Poles to be the same.

The last is, of Transparence and Refraction. Where he asserteth, That no Body, which was not Transparent from the Creation, can be made so by Humane Art. That Refraction is dependent upon Hardness in Conjunction with Gravity. And concludes with his Opinion of the Power of the Earth to produce living Creatures.

To these Dialogues, the Author subjoyns a supposed Demonstration of a streight Line, equal to the Arch of a Quadrant.

III. *Mechanick Exercises: Or, the Doctrine of Handy-Works. Began* Jan. 1. *prosecuted in two other Essays*, February 1. *and* March 1. 1677. *And intended to be continued monthly. By* Joseph Moxon, *Hydrographer to the King.*

THE Authors Undertaking, to set down what is already known, being good; and not unlikely to give occasion to others to consider of further Improvements in these Matters: it may not be thought improper, that the same, once for all, be here represented.

The Author, as he saith in his Preface, having for many years been conversant in Handy-Works, especially Smithery, Founding, Drawing, Joynery, Turning, Engraving, Printing of Books and Pictures, making of Globes, Maps, Mathematical Instruments; and being willing publickly to communicate his knowledg herein; hath in his first Essay begun with Smithery, as comprehending with the Black-Smiths Trade, all other handy-crafts, using either forge or file, from the Anchor-Smith to the Watch-maker: Which will be an Introduction to most other handycrafts, as having a dependance upon this. And first, he gives Account of the several Parts, Kinds and Uses of the Smiths Forge, Anvil, Tongues, Hammer and Sledg, Vice, Hand-Vice, Pliars, Drill and Drill-Bow, Skrew-Plate and its Taps. Then of Forging and the several Heats to be given: Of brazing and soldering. The several sorts of Iron and their proper Uses. And lastly, of Filing, and the several sorts of Files. In

In the second Essay, of the making of Hinges, Locks and Keys: The manner of Riveting, making of Screws and Nuts. And particularly, of cutting Wormes upon great Screws.

In the third Essay, of the making of Jacks, Bullet-molds, Twisting of Iron, Case-hardening. Some Tools not before describ'd. The several sorts of Steel; the manner of softning, hardning and tempering the same.

LONDON,

Printed for *John Martyn*, Printer to the *Royal Society*, 1678.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *April*, *May*, and *June*, 1678.

The Contents.

Monsieur Bullialdus's *Observation of the Occultation of* Saturn *by the interposition of the* Moon. *A Relation of Red* Snow; *communicated by the Honourable Mr.* Boyle. *Anatomical Observations of the Structure of the Nose; made by Monsieur* du Vernay. *Observations of some Animals, and of a Strange Plant, made in a Voyage into the Kingdom of* Congo; *by* Michael Angelo de Guattini, *and* Dionysius de Placenza. *Of the* Sorbus Pyriformis, *observed, by Mr.* Edmond Pitt *to grow wild in* England. *A Relation of a* Child, *which remained Twenty six years in the Mothers belly. An Account of some Books:* I. Exercitationes tres; *by Dr.* Wallis. II. Historiæ Animalium *Angliæ* tres Tractatus; *by Mr.* Lister. III. *Lectures and Collections*; *by Mr.* Hooke. *Advertisement of the continuance of the Mechanical Exercises*; *by Mr.* Moxon. *And of a New kind of* Globe; *invented by the Right Honourable the Earl of* Castlemain.

Societatis Regiæ *Anglicæ* Illustrissimis, celeberrimis atque Sapientissimis Viris *Ismael Bullialdus*, S.P.D.

Illustrissimi, Celeberrimi ac Sapientissimi Viri,

HAnc *à me habitam occultationis* Saturni *à* Luna *intercepti observationem ad vos transmittere, à vobis olim in Societatem vestram transcriptus, decrevi. Eam neque Tabulæ* Rudolfinæ, *neque meæ Philolaïcæ (etsi minus, quàm illæ, in punctis*

initii & finis a cœlo discrepent) exactè repræsentant, quod ex Lunæ *Motu, cujus quarta inæqualitas nondum benè cognita est, accidit; partimque ex* Saturni *motu discrepantia illa oritur; quem Tabulæ* Rudolfinæ *gradus unius semisse, meæ vero triente, quàm in cœlo appareat, penes longitudinem promotiorem ostendunt. Celeberrimi Viri* Joh. Hevelii *Observationes, quas in lucem intra annum prodituras sperare me jussit ipse, expecto, quarum ope adjutus Tabularum mearum correctionem aggressurus sum, si vitam Deus prorogarit, cujus annum Septuagesimum tertium decurrentem, si ille opt. max. concesserit*, Septemb. *proxime venturi die* 28 *complebo. Ut vos, Illustrissimi Viri, incolumes servet, prosperaque omnia largiatur, totis animi viribus precor, quos sincero pectore obsequiosissime veneror, ac officiosissimè saluto. Valete & me vestri cultorem amate.*

Scribebam *Lutetiæ Parisiorum*
anno 1678. *Maii* die 25 *st. no.*

Calculus ex Tabulis Philolaïcis Ismaelis Bullialdi *apparentis* ☌ ☾ & ♄, *quæ contigit* Februarii *die* 27. *post occasum* ☉ *anno* 1678. *exhibet.*

Locum ☉ verum ♓ gr. 9. '43. "19.
☾ ♊ 3. 46. 56. Lat. Mer. g. 1. '20. "0: in Zodiaco.
♄ ♊ 3. 46. 56. Lat. Mer. 1. 38. 0.
Caditq; hæc ☌ vera Hor. 7. '33. "26. Temp. med. Hora vero 7. '23. "31. T. App. *Parisiis.*
Parallaxis *Lun.* in Longit. gr. 0. '23. "40. occasum versus.
Latitud. 0. 24. 1. Semid. ☽ positas '15. "48.

Ad Hor. seq. H. 8. '23. "31.
Parallax *Lun.* in longit. gr. 0. 31. 15. Parallaxis Horiz. altit. '56. "11.
Differentia Parallaxium 0. 7. 34.
Lun. mot. Horar. verus 0. 30. 51.
Ablata parallax. differ. visus 0. 23. 17. per quem visum Horar. divisa priori parallaxi Longitud. datur Intervall. add. H. 1. '1. "0. visa itaque cadit H. 8. '24. "31.
Intervallo temporis reperto congruit motus *Lun.* verus gr. 0. '31. "22. major "7. quàm parallaxis posterior, rectè igitur inventa est ☌ visæ tempus.
Lat. *Lun.* vera Merid. desc. gr. 1. '22. "20.
Parallax. latit. in Merid. 0. 24. 37.
Additâ latit. veræ datur visa 1. 46. 57.
Lat. *Saturn.* Mer. 1. 38. 0.
Lun. centrum australius ♄ 0. 8. 57.

Ad

Ad Semihor. anteced. visam H.7. '54. "31.

Parallax. longit. *Lun.* gr. 0. '27. "17.
Minor quâ reperta Temp. visæ ♂. 0. 3. 58.
Semihorar. *Lun.* 0. 15. 25.
Ablatâ differ. Paral. Semihor. visus 0. 11. 27.
Parallax latit. 0. 24. 27.
Latit. vera *Lun.* Mer. Desc. 1. 21. 5.
Ergo additâ Parallaxi visa 1. 45. 32.
Centrum *Lun.* infra *Saturn.* 7. 32.

Ad Semihor. sequentem visam H. 8. '54. "31.

Parallax. longit. *Lun.* gr. 0 '34. "30.
Major paral. Temp. visæ ♂. 0. 3. 15. quæ ablata a motu Semih. vero dat. Semihorar. visum 0. 12. 10.
Parallax. lat. in Austrum 0. 25. 29. Lat. ☾ v. gr. 1. '23. "35. ergo dat.
Latit. *Lun.* visa Mer. Desc. 1. 49. 4. Centr. ☾ infra ♄ gr. 0. '11. "4.
Scrupula casus gr. 0. 12. 42.
Emersionis 0. 12. 42.
Maxima immersio antecedit ♂ visam gr. 0. '3. "2. Cadit ideo max. immersio H. 8. '21. "36.
Tandem divisis scrupulis incidentiæ per semihorar. visum ante visam ♂ dabitur intervallum temporis ab initio ad maximam immersionem '33. "18.
Iisdemque divisis per semihorarium visum post visam ♂ dabitur intervall. tempor. à maxima immersione ad finem '31. "15. Totaque duratio H. 1. '4. "33.
Parisiis itaque hujus occultat. ♄ interventu ☾ factæ, incidit *Febr.* die 27.

Initium	H. 7. '48. "18.
Maxima immersio	8. 21. 36.
Visa ♂	8. 24. 38.
Finis	8. 52. 51.

Tabulæ cœlo non consentiunt. Observavit siquidem Bullialdus *initium alto sup. Horiz. ad occasum* Capite Andromedæ *gr.* 18. '11. *unde datur Hora à Meridie* 7. '20. *T. A. sed med.* H. 7. '29. "55.
Finem vero vidit alta ad occas. *Cinguli Androm.* australiori magn. 2. gr. 21. '17. unde Hora à meridie colligitur T.A. 8. '30. "22.
Monere hic necessum est Tabulas *Philolaicas* ♄ promotiorem in Longitudine ostendere, quam in cœlo apparet, scrupulis primis ut minimum 19. ita ut ♄ tunc fuerit in cœlo in ♊. gr. 3. '28. & Lat. Austr. g. 1. '38.
Posito hoc ♄ loco H. 7. '20. Temp. app. initioque occultationis, datur.
Parallaxis *Lun.* in Longit. gr. 0. '23. "25.
Lat. in Austrum 0. 24. 1.
Lat. *Lun.* vera Mer. D. 1. 18. 11.
Addita parallaxi datur visa 1. 42. 12. & ☾ centrum Australius

Saturn. 4′. 48″. pro quibus 5′ accipiemus. Unde colligimus differentiam longitudinum ♄ & centri ☾ 14′. 59″. fuit itaque Centrum ☾ visum in ♐ gr. 3. 13′. 11″. cui cum addita fuerit parallaxis longit. habebimus prope verum, intra pauca scrupula secunda locum ☾ verum in Zodiaco ♐ gr. 3. 36′. 26″. Itaque *Saturni* longitudinem superavit *Luna* 8′. 36″. quæ vero motu conficit temporis scrupul. 16′. 46″. ita ut vera ☌ ☾ & ♄ inciderit H. 7. 3′. 14″. T. A. at Medio H. 7. 13′. 9″. Tabulæ ostendunt ☾ in ♐ gr. 3. 36′. 45″. Cœlum vero exhibuit in gr. 3. 18′. *Gem.* propterea motus longit. *Lun.* excedit cœlum 8′. 45″.

Juxta Observationem incidit vera ☌ ♄ & ☾ T. A. *Parisiis* H. 7. 3′. 14″.
Parall. Longit. *Lun.* gr. 0. 20′. 58″.
Latit. in Austr. 0. 24. 18.

Ad Hor. sequentem H. 8. 3′. 14″.
Parallaxis Longit. *Lun.* gr. 0. 28. 58.
Excedit parallax. priorem 0. 8. 0. quæ differ. ablata ab Hor. vero exhibet visum Horar. 0. 22. 51. per quem divisa parall. temp. ver.
Dat. interv. inter ver. & vis. h. 0. 55. 2. ad. tempori veræ.

Visa itaque cadit H. 7. 58. 16.
Parallaxis Longit. 0. 28. 16.
Latit. 0. 24. 18.
Latit. vera gr. 1. 20. 33.
Visa ergo 1. 44. 51. Centrum ☾ australius ♄ 6′. 50″.
Intervallo inter visam & veram congruit motus ☾ verus gr. 0. 28′. 17″. æqualis fere parallaxi Temp. visæ, unde momentum hujus rite inventum esse constat.

Ad semihor. anteced. visam H. 7. 28′. 16″.
Parall. Longit. ☾ 0. 24. 28.
Minor inventa tempore visæ 0. 3. 48.
Semihorarius ergo visus 0. 11. 37.

Ad Semih. seq. visam H. 8. 28. 16.
Parallax. Longit. ☾ gr. 0. 31. 47.
Major inventa Temp. visæ ☌ 0. 3. 31.
Semihorarius ergo visus 0. 11. 56.

Ad Horam 8. 30′. quo momento ♄ exivit è ☾.
Parallax. Longit. ☾. 0. 32. 3.
Latit. 0. 24. 49.
Latit. ☾ vera M. Desc. 1. 21. 52.
Latitudo visa. 1. 46. 41. Centr. ☾ infra ♄ 9′. 41″.

Ex

Ex superioribus latitud. ☾ & ♄ colliguntur simul tota scrupula durationis 28′. 24″. distantia quoque max. immersion. à visa ♂ reperitur 1′. 41″. temporis, quo max. immersio antecedit visam. Quare illa max. imm. contigit H. 7. 56′. 35″.

Data sunt scrup. dimidiæ durationis 14′. 12″. quæ divisa per semihorar. visum ante visam 11′. 37″. exhibent incidentiam 36′. 41″. divisa vero per visum semihorar. post visam ♂ exhibent emersionem 35′. 42″. ut tota duratio sit H. 1. 12′. 23″. major observata 2′. 1″.

Contigit itaque *Parisiis* hujus occultationis ex superiori calculo, & ex suppolito ♄ loco.

Initium	Hor. 7. 19′. 54″.	observatio	H. 7. 20′. 0″.
Max. immers.	7. 56. 35.		
Visa ♂	7. 58. 16.		
Finis	8. 32. 17.	Observ.	8. 30. 22.

Locum ♄ minus promotum suppolumus observatione fulti quam habuimus mense *Decemb.* 1677. die 29. *st. no.* paulo ante Hor. 9. à Meridie H. 8. 58′. tunc enim vidimus in eodem azimutho inque Nonagesimo Ecliptica gradu ab Horizonte ♄ & *Boreum* oculum ♉, qui infra ♄ erat unde Planetam & fixam eandem in Zodiaco Longitud. obtinere deprehendimus. Juxta *Tychonem* fuit Stella fixa in *Gemin.* gr. 3. 58′. 53″. cum lat. Austr. gr. 2. 36′. 30″. tunc fuerunt motus ☉ & ♄ juxta Tabulas Philolaïcas.

	S.	gr.	′	″
☉ Long. med. ab Aquin.	9.	8.	50.	0.
Aphelium	69.	6.	48.	22.
Anom. med.	6.	2.	1.	38.
Æquata	6.	2.	3.	46.
Æquatio add.	0.	0.	4.	23.
Locus *Sol.* verus	♍	8.	54.	23.

♄ Longit. ab Æq. media	2.	10.	4.	11.
Aphelium	♐	28.	26.	5.
	☊	69.	21.	4.	5.
Anomal. med.	5.	11.	38.	6.
Æquata	5.	10.	35.	35.
Æquatio subt.	0.	2.	13.	46.
Locus ♄ ex ☉ visi	♎	7.	50.	25.
Anomal. Orbis	7.	1.	53.	58.
Æquatio max.	0.	6.	15.	0.
Pars Anom. orb. congr. Sub.	0.	3.	32.	54.
Locus ♄ ex *Terra* visi	♎	4.	17.	31.
Loci ♄ ex ☉ distantia ☊	10.	16.	46.	20.
Sinus latit.	0.	2.	1.	30.
Scrup. prop. latit.	0.	0.	58.	27.

Saturnus ergo juxta nostras Philolaicas debuit esse in ♎ gr. 4. 17′. 31″. Austr. lat. gr. 1. 52′. qui nobis observatus in ♎ g. 3. 58′. 53″. unde cœlum in longitudine minore ♄ ostendit, quam Tabulæ exhibent, scrupulis primis circiter 19′, qui Tabularum excessus perduravit ad occultationem ♄ à ☾ factam, & adhuc perdurare excessum illum certum est, quod ita esse ex aliis observationibus

Decre-

cog-

	S.	gr. ′ ″
Decrementum	0.	0. 0.24.
Scrup. prop. Decrem.	0.	0.47.30.
Pars decrem. iis compet.	0.	0. 0.17.
Scr. prop. Æquata.	0.	0.58.10.
Sinus ipsis congr.	0.	1.57.30.
Latit. ♄ Mer. Az.	0.	1.52. 2.

cognovimus. In hac porro observatione adhibita Illustrissimi Viri *Joh. Hevelii* Lunaris disci descriptione, in illa limbi parte, quæ in recta linea, à medio montis *Beroſi*, per montes *Kiphæos* ducta, paulo supra *Alanum* montem, infraque terminos australes paludum hyperborearum sita est, *Saturnum* emersisse aspeximus, quod cum instituto posteriore calculo prope concordat.

Calculus occultationis ♄ *à* ☾ *ſecundum Tabulas* Rudolfinas *acceptis locis* ☾ *&* ♄ *ex Clariſſ. Viri* Joh. Heckeri *Ephimeridibus.*

Febr. D. in Merid. Longit. Latit. M. Desc. Longit. Latit. M. Asc.
27. ☾ ♉ gr. 29. 27′. 19″. gr. 0. 55′. ♄ ♊ g. 3. 57′. g. 1. 42′.
28. ♊ 11. 53. 2. 1. 58. 4. 0. 1. 41.

Locus ☾ in Orbita ♉ 29. 27′. 19″. in Meridie reperitur, reductus vero ad Zodiacum ablata reductione 3′. 20″. est ♉ 29. 23′. 59″. abest igitur à ♄ gr. 4. 33′. 1″.

☾ diurnus est gr. 12. 25′. 43″. Hinc horarius in orbita 31′. 4″. ♄ diurnus est 3′. ergo horar. est 7″. ☾ horar. à ♄ est 30′. 57″.

Contigit ergo vera ☾ ac ♄ conjunctio juxta Tabulas *Rudolfinas Vraniburgi* D. *Febr.* 27. h. 8 47′. 24″. T. M. à quo ablata æquatione temporis 14′. datur Temp. App. hor. 8. 33′. 24″. *Pariſiis* vero fuit hor. 7. 53′. 24″. Semid. ☾ 15′. 26″. Parallax. Horiz. Alt. 60′. 2″.

☾ Parallaxis Longit. gr. 0. 29′. 28″.
Latit. 0. 25. 55.

Ad Hor. sequent. 8. 53′. 24″.
Parall. Longit. ☾ gr. 0. 36. 56.
Latitud. 0. 27. 9.
Parall. Longit. hoc momento excedit antecedentem repertam tempore veræ 0. 7. 28. qui excessus ablatus ab ☾ Horar.
Vero à ♄ dat. visum H. 0. 23. 29.

Per hunc divisa parallaxi tempore veræ conjunctionis colligitur inter veram & visam intervall. H. 1. 15′. 19″. add. Temp. vera ♂. Ergo facta est visa *Pariſiis*, Hor. 9. 8. 9. Intervallo vero temporis congruit verus motus Longit. ☾ 38. 46.

Tunc fuit Parall. ☾ Longit. gr. 0. 38′. 52″.
Latit. 0. 27. 37.

Cum ergo motus ☾ verus congruens intervallo inter visam & veram æqualis sit parallaxi tempore inventum exactè est tempus visæ.

Ad

Ad semihor. anteced. visam Hor.8. 38'. 46".
Parall. longit. ☾ gr.0.35'.20". minor parallaxi temp. visæ.
Differentia ambar. 3.32. ablata à ☾ semihor. vero.
Relinquit semihor.vis.0.11.57.
Latit. parallax. 0.26.47.

Ad semihor. seq. visam H.9.38'.46".
Parallax. longit. ☾ gr.0.41. 7. major quam parallaxis
Tempore visæ,ambar. differ. 0. 2.15. ablata à semihorar. ☾.
Vero relinquit semihor.visum0.13. 4.
Parallax. lat. 0.28.41.

Tempore visæ ♂ Lat.☾ vera 1.18.58.
Addita Paral.datur vis M.D. 1.46.33.
Latit. *Saturn.* 1.42. 0.
Centrum ☾ est australius ♄ 0. 4.33.

Scrupula durationis totius 0.29.30.
Dimidiæ, seu incidentiæ 0.14.45.
Divisa per semihor. visum antecedentem visam
♂ exhibent. temp.incid.H.0.37. 2. eadem divisa per semihor. vi-
Visam ♂ dant temp. emers. 0.33.50. (sum sequentem.
Totam durationem H.1.10.52.
Max. immersio antecedit visam ♂ temporis 1'. 9".
quare cadit illa H.9.7. 0.
Parisiis ergo videri debuerunt
Initium H.8.29'.58"
Max.imm. 9. 7. 0.
Visa ♂ 9. 8. 9.
Finis 9.40.50.

Juxta Tabulas itaque Rudolfinas *incipere debuit hæc occultatio, cum jam totam transactam fuisse observavimus.*

Extract

Extract of a Letter sent from Genoua *to Sign.* Sarotti, *the* Venetian *Resident here, and by him communicated to the Honourable Mr.* Boyle.

ON Sr. *Josephs* day, upon the Mountains call'd *Le Langhe*, there fell upon the white Snow, that was there already, a great quantity of *red*, or if you please of *bloody* Snow. From which, being squeezed, there came a water of the same colour. Of this there are here many Eye Witnesses.

Anatomical *Observations of the Structure of the Nose: made by Monsr.* du Vernay. *Taken out of the* Journal des Scavans.

AN account is here given of a Book entitled, *Philosophia Vetus & Nova.* The Learned Author whereof hath collected and composed together into one *Systeme* a great number of excellent Observations; amongst the rest of which, here briefly mention'd, we have this, no where else published that I know of, set down at large, as follows.

Of the Structure of the Nose, Monsr. *du Vernay* observes, That the cavities hereof are fill'd with many *Cartilaginous Lamines* distinct one from another: every *Lamine* being divided into many others, all folded almost into a *spiral* line. That the *Os Cribrosum* is made up of the extremities of these *Lamines*, which butt upon the Root of the Nose; the holes wherewith it is pierced, being the intervals between the *Lamines*.

They are designed to uphold the inner *Tunick* of the Nose. Which *Tunick*, being a principal *Organ* of *Smelling*, hath received from Nature a very great expansion: for the commodious placing whereof, Nature hath *folded* it round about together with these *Lamines*; that by this industrious *Mechanism*, she may employ all its length in a very little room.

This *Tunick* is fill'd with an innumerable company of small *Rays*; so many branches of *Arteries* and *Veins*; and especially *Nerves*; by which it hath a most exquisite sense. Yet because the particles of Odorant bodies are so subtil, that they can but very softly glance upon the *Organ*; Nature hath therefore provided by this great expansion, that there

there may be place for so much the greater number of these particles to strike it at the same time, and so to render their impression more strong.

And that these odorant particles, which run with the Air into the Nose, in smelling, might not all forthwith pass off from thence into the breast: Nature by this *Labyrinth*, made by the windings of the *Lamellæ*, hath taken care to give them an arrest and longer stay. And for the same reason, she hath furnished the said *Tunick* of the Nose with a great many small *Glands*, which open thereinto; and so moisten it with a thick and slimy exudation, the better to entangle the dry odorant particles.

This *Tunick* examined and compar'd in several Animals, shews also much of the reason of the *delicacy* of Smelling in some, above what it is in others. For look how much a finer Nose it is that Animals have, they have likewise so much a greater number of these *Lamellæ*, wherewith the said *Tunick* is roll'd up in so many more folds. So the Nose of a Hound is better furnished with them, than that of any other Animals. The Hare, Fox, Cat, Wild Boar, have a considerable number of them. Those Animals that chew the Cud, have fewer. And Man is less provided for, than any of the rest. *Thus far the Learned Observer.*

And Note, That not only the number, but also the length of the *Lamellæ*, is of great use for the strength of Smelling. For which purpose most *Quadrupeds*, which either hunt, as the *Carnivorous*; or at least want reason otherwise to distinguish their food, than by the smell, as the *Graminivorous*; have their Nose not placed in the middle of the face, as in Man; but prolonged to the very end.

Observations of some Animals, and of a strange Plant, made in a Voyage into the Kingdom of Congo: *by* Michael Angelo de Guattini *and* Dionysius *of* Placenza, *Missionaries thither. Extracted out of the* Journal des Scavans.

IN *Brasil*, there are certain little Animals, by the Author call'd *Poux de Pharaon*, which enter into the feet betwixt the skin and the flesh. They grow in one day as big as Beans. And if they are not presently drawn out, they

make an unſupportable Ulcer, and all the foot corrupts.

In the Kingdom of *Congo*, there are *Serpents* twenty five foot long, whichwill ſwallow at once a whole Sheep. The manner of taking them is thus: When they lie to digeſt what they have eaten, they ſtretch themſelves forth in the Sun: which the *Blacks* ſeeing, kill them. And having cut off their Head and Tail, and embowel'd them, they eat them; and ordinarily find them as fat as Hogs.

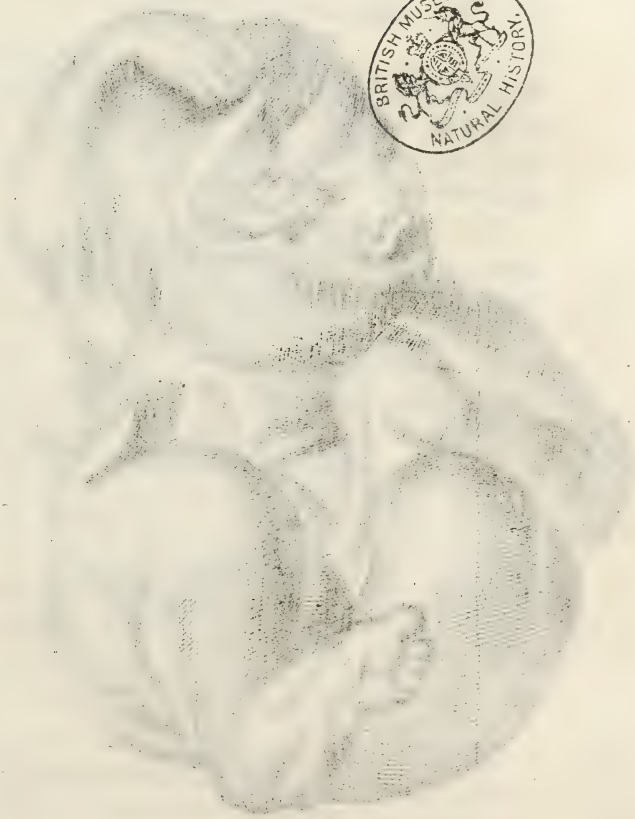
There are here a great number of *Ants*, and of that bigneſs, that the Author reports, that being one day ſick in his bed, he was forced to order himſelf to be carried out of his room for fear of being devoured by them. As it often happens to thoſe of *Angola:* where you may alſo find in the morning, the Skelitons of *Cows* devoured by theſe *Ants* in one night.

Amongſt other fair Fruit Trees in *Brazeil* there is one, whoſe Fruit is called *Niceffo:* which hath this remarkable, that it hath but two Leaves; whereof each is able to cover a man.

Extract of a Letter from Mr. Edmund Pitt, *Alderman of* Worceſter, *a very knowing* Botaniſt; *concerning the* Sorbus Pyriformis.

LAſt year I found a Rarity growing wild in a Foreſt of this County of *Worceſter.* It is deſcribed by *L'Obelius* under the name of *Sorbus Pyriformis:* as alſo by *Mathiolus* upon *Dioſcorides.* And by *Bauhimus*, under the name of *Sorbus Procera.* And they agree, that in *France*, *Germany*, and *Italy* they are commonly found. But neither Theſe, nor any of our own Country-men, as *Gerard*, *Parkinſon*, *Johnſon*, *How*, nor thoſe Learned Authors *Merret* or *Ray*, have taken notice of its being a Native of *England.* Nor have any of our *Engliſh Writers* ſo much as mention'd it. Saving, that Mr. *Lyte*, in his Tranſlation of *Dodonæus*, deſcribes it under the name of the *Sorb-Apple.* But ſaith no more of the *place*, but that it groweth in *Dutch-Land.*

It


BRITISH MUSEUM
NATURAL HISTORY.

Trans. N°. 139.

It reſembles the *Ornus* or *Quicken Tree*; only the *Ornus* bears the *Flowers* and *Fruit* at the *end*, This, on the ſides of the Branch. Next the Sun, the Fruit hath a dark-red bluſh: and is about the bigneſs of a ſmall *Juneting Pear*. In *September*, ſo *rough*, as to be ready to ſtrangle one. But being then gather'd, and kept till *October*, they eat as well as any *Medlar*. *Thus far the Letter.*

Q. Whether a Verjuyce made of this Fruit, either ground with Crabs, or Grapes, or if plentiful, alone, would not, being kept for ſome time, prove one of the beſt acid-aſtringent Sawces, that Nature affords.

A Relation of a Child which remained Twenty ſix years in the Mothers Belly. Taken out of the Journal des Scavans; *being the Extract of a Letter written from* Touloſe 22. June *to the Author of that* Journal, *by Monſieur* Bayle, *M.D.*

THe ſaid Author premiſes, that there having been many different Reports of this matter: Monſieur *Bayle* took the pains to give an exact account, as well of the Infant, as of what accidents befell the Mother during her being big with It. Taking alſo the Figure of the Infant, as it was ſeen of the whole Town.

Margaret Mathew, Wife of *John Puget*, Shearman, being with Child 1652. perceived about the end of the ninth Month of her bearing, ſuch pains as Women uſually have, when about to fall in Labour. Her Waters alſo brake: but no Child follow'd. For the ſpace of Twenty years, ſhe perceived this Child to ſtir: with many troubleſom Symptoms accompanying. Which made her from time to time, to deſire the Chirurgeon to open her Belly, and take out this grievous burthen. But for the ſix laſt years, ſhe perceived not the Child to move. Being lately fall'n ſick, ſhe requeſted the Chirurgion to open her when ſhe was dead. She died 18. *June* this year 1678. She was opened the next day, and a dead Child was found in her Belly, out of the Womb, no way joyned or faſtened to it. The Head downward; the Buttocks hanging toward the left ſide; The Arms and Legs in the poſture the Figure repreſents.

All the back part of this Child was covered with the *Omentum*; which was about two fingers thick, and ſtuck hard to divers parts of the Body of it, not to be ſeparated without a Knife; which being done, very little blood iſſued. This Infant weighed Eight pounds Haverdupoyſe. The Skull was broken into ſeveral pieces. The Brain of the colour and conſiſtence of Oyntment of *Roſes*. The Fleſh red, where the *Omentum* ſtuck, other parts whitiſh, yellowiſh, and ſomewhat livid; except the Tongue, which had the natural ſoftneſs and colour. All the inward Parts were diſcolour'd with a blackiſhneſs, except the Heart, which was red; and without any iſſuing blood.

The Forehead, Ears, Eyes and Noſe, were cover'd with a Callous ſubſtance, as thick as the breadth of a finger: which being taken away, the parts appeared, as in the Figure.

The Gums being cut, the Teeth appeared in the adultneſs of thoſe in grown perſons. The Body had no bad ſmell, though kept three days out of the Mothers Belly. The length of the Body from the Buttocks to the top of the Head, about 11 Inches. The Mother died about the Sixty fourth year of her Age.

An Account of ſome Books.

I. Johannis Walliſii, *S. T. D. in Celeberr. Academia* Oxonienſi *Geometriæ Profeſſoris* Saviliani, *Exercitationes Tres*: 1. *De Cometarum Diſtantiis inveſtigandis.* 2. *De Rationum & Fractionum Reductione.* 3. *De Periodo Juliana.* Londini, 1678.

CONcerning the firſt, the Learned Author acquaints us, in the beginning thereof, That about fifteen or ſixteen years ſince, it was propoſed to himſelf by that excellent Mathematician Sir *Chriſtopher Wren*, as a thing of uſe, *ſc.* To find out the Diſtances of Comets from the Earth: and ſince then, hath been by him, * otherwiſe than is here, performed. To whom our Author then returned an Anſwer, *ſc.* This ſame, which upon our Worthy Countrey-man Mr. *John Collins* his requeſt, he hath here publiſhed.

*See Mr. *Hooks* Book, entituled, *Lectures* and *Collections*; or the Account of it hereafter given in theſe Tranſactions.

The

The Probleme he sets down thus;

Expositis in eodem Plano, quatuor Rectis positione datis, quintam invenire, quæ ab expositis ita secetur, ut interjecta segmenta sint in ratione datâ. Whereof he gives the solution at large.

The second Treatise is designed also chiefly for the use of Astronomers; who often enquire, the mutual proportion either of the Parts of some one Planetary Systeme, or of any two Systemes. As also of the Distances and Magnitudes of Cœlestial Bodies. Which to give in the least Numbers, and so as to avoid greater Fractions, is a performance of as great use, as delight, and altogether new.

The Probleme, the Solution whereof taketh up the greater part of this Exercitation, is as follows, *vid.*

Expositâ Fractione quâvis (putà $\frac{2684762}{8376571}$*) Fractionem invenire, quæ sit vel Expositæ æqualis, si fieri possit; vel saltem, quæ Expositam vel proximè superet, vel ab eâ proximè deficiat, Denominatorem habens dato Numero non majorem: (putà, quæ numerum* 999 *non superet, seu tres locos non excedat:) sitque in Terminis minimis.*

For the doing of which, he first lays down his Method at large. Next, gives a summary of all the Rules. And then subjoyns several Examples in both the above specified Reductions.

To this he adds also, in the end, the way of finding out of the Proportion of the Diametre of a Circle to the Circumference: proposed in his own words thus, *vid.*

Ratio Diametri ad Perimetrum Circuli vero minor, sed continuè crescens; seu Perimetri ad Diametrum vero major, sed contiuuè decrescens; donec intra assignatos terminos consistat.

The last Treatise containeth the Solution of this Probleme, *vid.*

Expositio Anno, qui sit, verbi gratia, in Cyclo Solari, Annus 22, *Lunari,* 14, *Indictionum,* 7: *quæritur, quotus sit ille Annus Periodi* Julianæ.

H. Martini

II. Martini Liſter *è Societate Regia*, Londini, *Hiſtoriæ Animalium* Angliæ *tres Tractatus. Unus*, *de* Araneis. *Alter*, *de* Cochleis *tum Terreſtribus*, *tum Fluviatilibus. Tertius*, *de* Cochleis *Marinis. Quibus adjectus eſt quartus*, *de Lapidibus ejuſdem* Inſulæ *ad* Cochlearum *quandam imaginem figuratis.* Londini, *apud* J. Martyn *Reg. Soc. Typogr.* 1678.

THe Learned Author, in his Preface, acquaints us, amongſt other things, with the great care he took in preparing his Obſervations for this Work. Principally deſigning herein a moſt exact diſtribution of the kinds of thoſe Animals whereof he Treateth, into their ſeveral ſorts. To the end, that what ever Experiments or Obſervations ſhall be made by others hereafter of theſe Animals, worthy publiſhing, they may hereby be referred to their proper places.

The firſt Tract containeth two Books. The former whereof treateth of *Spiders* in general. As a deſcription of their ſeveral Parts, both outward and inward. Of their Generation. The Nature and Emiſſion of their Thred. Caſting their *Cuticle*. Of their Food. Venom. Several either falſe or dubious Traditions concerning them. Medicines made of them.

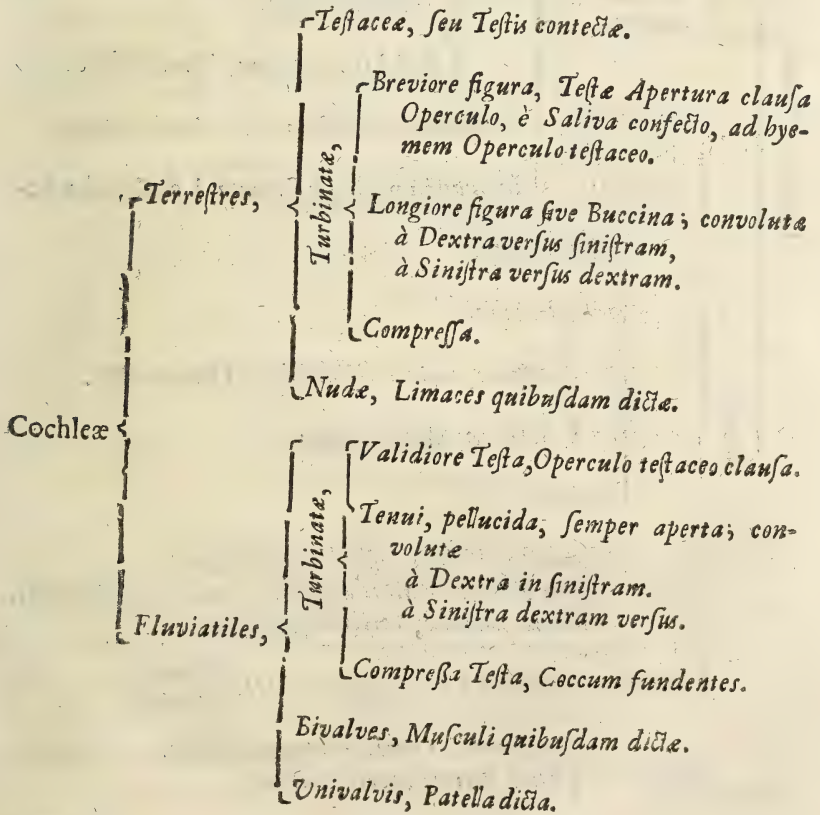
The Second Book containeth a diſtribution of *Spiders* into their ſeveral *ſpecies*, as followeth in the Authors own Table.

- Aranei
  - *Octonoculi*,
    - *Aucupes*; *qui, Muſcas capiendi causâ tendunt*
      - *Reticula*
        - *Scutulata Antiquis dicta*; *ſcil. univerſis maculis in eodem plane diſpoſitis*, *in modum Scuti ſive Orbitæ.*
        - *Conglobata*; *ſcil. maculis crebris in omnes in circuitu dimenſiones procedentibus.*
      - *Telas linteoformes*; *ſcil. Reticulorum filis denſè inter ſe contextis in modum Veli ſive Panniculi.*
    - *Venatorii*; *qui aperto marte Muſcas inſectantur, cùm tamen aliàs texere poſſunt*; *nimirum Telas ad Nidificationem, & ad hyberna.*
  - *Binoculi, ferè longipedes, Opiliones quibuſdam dicti, Telis digitatis ſive forcipatis, Cancrorum more armati.*
    - *Lupi, propriè ſic dicti.*
    - *Cancriformes.*
    - *Phalangia, ſ.* Aranei Pulices *aſſultim ingredientes.*

Under which, he hath alſo ſome other Subdiviſions, made afterwards, in their ſeveral proper places. Of

Of all which he likewiſe exhibits the Figures, ſets down the Deſcriptions, Place, Time of Laying, Manner of Coition. Deſcribes their Eggs, Neſts, Nets, Threds. Speaks of their Food and manner of Living, very high aſcent into the Air, &c. The Work containing many curious Obſervations, not only out of our Country-man *D. Mouffet*, and other Learned Authors, but of his own likewiſe, and ſuch as are altogether new.

The Second Tract hath Three Parts. The firſt of *Snails* in general. As of their Shells, and other parts both outward and inward. Their *Saliva*, Eggs, Food. Uſe in Medicine. Diet, &c. The ſecond of *Land Snails*. The third of *River Snails*. The ſeveral ſorts whereof are figur'd, deſcribed, and comprized by the Author within the following Table.



The

The Third Tract is of *Sea-Snails*, which by the Author are figur'd, and distributed into the following Table.

- Cochleæ Marinæ
  - Turbinatæ,
    - *Intortæ, sc. anfractuosæ.*
      - *Figura productione.*
      - *Breviore.*
    - *Orbes non habentes*, Echinus *dictus.*
      - Cochleæ *formes.*
      - *Umbone minimè omnium extante*, Neritæ *dictæ.*
      - *Basi lata & plana*, Trochi *dictæ.*
  - Bivalves,
    - *Ex omni parte arctè clusiles.*
      - *Omnium patentissima*, i. e. Auris marina.
      - *In angustam rimam formata*, i. e. Concha Veneris.
    - *Non Striatæ.*
      - *Conchæ.*
      - *Asperæ, valvis dissimilibus*, Ostreæ *dictæ.*
      - *Setiferæ*, Musculi *dictæ.*
    - *Striatæ.*
      - *Auritæ, Valvis dissimilibus, Pectines.*
      - *Non Auritæ, Valvis æqualiter concavis, Pectunculi.*
      - *Minus concavæ, Tellina quibusdam.*
    - *Altera aut utraque parte semper hiantes.*
      - *Læves.*
      - *Striatæ.*
- *Testæ apertura cavaliculata*, Buccina *rostrata dicta.*
  - *Lævis.*
  - *Striatæ.*
- *Plana Apertura.*
- *Univalves,*
  - *Loco mobiles vertice integro, Patellæ.*
  - *Fixæ, vertice aperto, Balani.*

The

The last Book *de Cochlitis Angliæ*, presenteth the Figures and Descriptions of as many as are contained in this Table, *vid.*

- Cochlitæ Angliæ
  - Turbinati,
    - Intortæ, S. anfractuosi.
      - Quorum Orbes in se convolvuntur, Cornua Ammonis.
      - Utrinq; ad Umbilicum æqualiter concavi.
        - Striati.
        - Læves.
      - Ex alterâ tantum parte.
      - Umbilico utrinque prominulo.
    - Buccinorum in modum producti.
      - Striati.
      - Læves.
      - Productiores.
      - Cochleæ formes.
    - Qui Helicem, sc. Volutam non habent.
  - Striati subrotundi, ut Echinitæ.
    - Striis in omnes partes æqualiter procedentibus.
    - Striis inæqualiter procedentibus.
  - Læves in acumen fastigiati, ut Belemnitæ.
  - Bivalves,
    - Læves,
      - Utráque Testâ æqualiter concavâ.
        - Figurâ ex alterâ cardinis parte diffusiore.
        - Ex utráque parte æqualiter diffusi.
        - A cardine ad imum marginem productiores.
        - Ventricosi, quibusdam Bucarditæ.
      - Testis inæqualibus.
    - Ostracitæ.
    - Conchitæ rostrati.
    - Striati,
      - Auriti, Pectinitæ.
      - Sine auribus, Pectunculitæ.

The Author in his Preface to this last Book, inclines to their Opinion, who take not these figur'd Bodies for Petrified Shells, but to be bred like other Stones, in the Earth. For which he offers some Arguments either not, or less insisted on by others.

These three last Books are composed with the same accurateness as the former.

III. *Lectures and Collections made by* Robert Hooke, *Secretary of the* R. Society. *Printed for* J. Martyn, *Printer to the* R. Society, 1678.

THe Work is divided by the Learned Author into two Parts. The first is called *Cometa*; containing, besides Observations of the Comets of 1664, 1665, and 1677, discourse also on Comets in general. As amongst other particulars, of the Head, *Nucleus*, and *Blaze*. That this is not always opposite to the Sun. Their Magnitude, Substance; thought, by the Author, loose and confusible; as from the variation of the Magnetical direction, he supposeth that also of the inner parts of the Earth to be. Density, Mutability, Dissolution, Fluidity, Gravity, Light, Figure, Motion, whether bended or strait, with equal or unequal velocity, &c. A Digression of the method of Speculating the great and first Principles of the Universe, Theory of Comets, as to Parallax hitherto defective. What the World expects from Mr. *Hevelius*. Parallaxes arising from Hypotheses of the proper motions either of the Earth, or Comet, or both together consider'd, arise to a certainty of the Magnitude of Comets: others, depending on other suppositions, not. Allowing inequality of Motion, and more compounded Curve Lines, nothing can be determin'd. A gravitation towards the Sun, makes out the Motion of the Comet, and direction of the Blaze. Comets waste in the *Æther*, which is as a Menstruum to dissolve them. The way of enquiring Parallax by Telescopes further explain'd. A second way by two Observers at a distance propounded: A third way of Sr. *Christ. Wren*, his Majesties Surveyor General, set down and demonstrated by a Geometrical Probleme, an Invention altogether new. And how exactly all the Observations he had of the above-said Comets, were made out by it: together with his own Schemes. Communicated *Febr.* 166$\frac{7}{8}$.

Speaking of the nature of the *Blaze*, introduceth a Discourse of the Honourable Mr. *Boyle*, *&c.* A Memorial of some Observations made upon an Artificial substance, in the possession of Mr. *Craft* a famous *German* Chymist, that shines without any precedent illustration. Wherein, amongst other particulars, is observed, that two spoonfuls of matter did enlighten a large Glass-sphere. Liquor shaken, had a smoke

and

and flash'd. A dry substance, affirm'd to have continued shining two years, flash'd. Seemed to partake of the odor of *Sulphur* and of *Onions*. It fired *Gunpowder* first warmed. And a Whi e paper, held a considerable distance over Coals. To which are added some Experiments on the *Phosphorus Baldwini* in *vacuo*, and in the open Air.

To these are added Mr. *Gallet*'s *Apparatus* for observing ☉ in ☿, and his observations of 4 Spots in ☉; contained in a Letter to Mr. *Cassini*. Mr. *Cassini*'s reflexions hereon. And his further discoveries about the motion of *Jupiter* upon its own Axis, and several new Appearances of that Planet. Together with Mr. *Hally*'s Observat. of ☿ *sub* ☉. Three Southern Stars never visible in *England*. And the 2 *Nubeculæ*, called by Saylors, the *Magellanick Clouds*; in a Letter to Sir *Jonas Moore*.

The Second Part is called *Microscopium*. In which, two Letters from Mr. *Lewenhoeck*, containing further Observations of the little Animals, of several kinds, bred in Water, after the infusion of *Pepper*. Likewise of the Particles of Blood, Milk, Phlegm, Gums dissolved and precipitated. The manner how the same were also seen at the Meetings of the *R. Society*. As also how to find the figure and texture of Animal and vegetable parts. A description both of double and single *Microscopes*; and how they are to be used. Of the like little Animals (as above) bred upon steeping other Grains in Water, as well as *Pepper*.

Hereto is added a Relation of the Symptoms following the slipping of a Leaden bullet into the Wind pipe of a certain person, and there sticking till his death, which hapned not before some years after. Together with what was observable in his *Lungs* upon Dissection; in a Letter from Mr. *James Young*, an experienced Chirurgion in *Plimouth*.

To the whole Book are added Five Tables of Figures.

An Advertisement of the Monthly continuation of the Mechanick Exercises; *by Mr.* Joseph Moxon.

THe Ingenious Author having begun and continued his three first Months Exercises on *Smithery*: in these three next, he gives an account of *Joynery*.

In the first, a description of some Tools Then of Setting the Iron. Of the Joynter. The Strike Block. The Smoothing Plain. Rabbet Plain. The Plow. Molding Plains. Grinding and Whetting

ing the Edg-Tools. Of Forms. The Paring-Chiſſel. Skew-Former. Morteſs-Chiſſel. The Gouge.

In the ſecond; Of the Square. Of Plaining and Trying a piece of Stuff ſquare. To frame two quarters Square one into another. The Miter Square. The Bevil. Miter-Box. The Gage. the Piercer. Gimblet. Augre. Hatchet. Of Saws in general. Particularly of the Pit-Saw.

In the laſt; Of the Whip-Saw. The Hand-Saw. The Frame-Saw, and Tenant-Saw. The Compaſs-Saw. The Rule. Compaſſes. Glew, and Glewing. The Waving Engine. Wanſcoting of Rooms. Together with an Alphabetical Table of Terms uſed among Joyners, and their Explanation.

The Author hath alſo given the Figures of all their Tools.

At the end of the laſt Mechanical Exerciſe (vid. *Numb.6.*) *the Author giveth notice of a new Invention. Which I think fit likewiſe here to do, in his own words, as follows.*

THere is invented by the Right Honourable the Earl of *Caſtlemain* a new kind of Globe, called (for diſtinctions ſake) the *Engliſh Globe*; being a fix'd and immoveable one, performing what the Ordinary ones do, and much more, even without their uſual Appendancies, as *Wooden Horizons*, *Brazen Meridians*, *Vertical Circles*, *Horary Circles*, *&c.* For it compoſes it ſelf to the Scite and Poſition of the World, without the *Mariners Compaſs* or the like Forein help; and beſides, other uſeful and ſurprizing operations (relating both to the *Sun* and *Moon*, and performed by the Shade alone,) we have by it not only the conſtant proportion of Perpendiculars to their Shades, with ſeveral Corollaries thence ariſing, but alſo an eaſy new and moſt compendious way of deſcribing *Dials* on all Planes, as well Geometrically as Mechanically, moſt of which may be taught any one in few hours, though never ſo unacquainted with the Mathematicks.

To this is added on the *Pedeſtal* a Projection of all the appearing *Conſtellations* in this Horizon, with their Figures and Shapes. And beſides, ſeveral new things in it differing from the common *Aſtrolabe* (tending to a clearer and quicker way of operating) the very Principles of all *Steriographical Projections* are laid down and Mathematically demonſtrated, as is every thing elſe of moment throughout the whole Treatiſe.

Theſe *Globes* will be made and expoſed to Sale about *Auguſt* next (God willing) againſt which time the Book for its uſe will alſo be printed, and ſold by *Joſeph Moxon* on *Ludgate-Hill* at the Sign of the *Atlas*.

LONDON,
Printed for *John Martyn*, Printer to the *Royal Society*, 1678.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *July*, and *August*, 1678.

The Contents.

Anatomical Observations in the body of a Woman, who died Hydropical in her left Testicle: Made and communicated by Dr. Henry Sampson. *Microscopical Observations of the Structure of the Teeth and other Bones: Made and communicated, in a Letter, by Mr.* Anthony Leuwenhoeck. *Of the Grain of* Ivory. *Microscopical Observations of the Structure of Hair: Made also and communicated by Mr.* Anthony Leuwenhoeck. *Extract of a Letter written by* Signior Boerelli, *about the price of his* Telescopes: *Communicated by Sir* Jonas Moor. *A new Invention of a Clock ascendent on a Plain Inclin'd; by Mr.* De Gennes: *Taken out of the Journal* Des Scavans. *A New Engine to make Linen Cloth without the help of any Artificer; Presented to the R. Academy by* M De Gennes: *Taken also out of the Journal* Des Scavans. *A Relation of a Worm voyded by Urine: Communicated by Mr.* Ent. *An Essay of making Conjecture of dispositions by the Voice: Communicated also by the forementioned person. An Account of some Books: Extracted out of the Journal* Des Scavans. I. Museo Cospiano annesso a quelle del famoso *Ulisse Aldrovandi* Descrizzione di Loreuzo Legati. II. Systema Bibliothecæ Collegii Parisiensis Soc. Jesu. III. Glossarium ad Scriptores Mediæ & Infimæ Latinitatis: Autore Carolo du Fresne Domino du Cangi, *&c.* IV. Explication Novelle & Mechanique des Actions Animales, Par *M. Duncan, D.* en Med.

Anatomical Observations in the Body of a Woman about 50 years old, who died Hydropical in her left Testicle, Decemb. 30 1677. *Made and Communicated by the Learned Dr.* Henry Sampson. *Extracted out of his Latine Copy, by the Author of these Transactions.*

SHe had been married, but had never born Child. Had been a Widdow for about ten years before her death. In which time she was much oppressed with grief; and her Belly, by degrees, began to swell: yet not much, till about four years before she dy'd, In the year 1678; at which time she weighed 216 *l.* I advised her to the use of *Cathartick Hydragoges*, and *Diureticks*, after the use of which for some time, she weighed but 200 *l.* But still the *morbifick* matter was reaccumulated to the diseased Part. So that resolving to forbear further Medicines, within half a year after, she weighed 250 *l.* her belly being, at last, so far distended, as to hang down, as she sat, a good way below her knees.

Being called to open her, I put a Pipe into the Cavity of the *Abdomen*, with intent to exhaust the *Serum* supposed to be gathered therein. But hereupon there issued only some few drops like the white of an Egg. At another place there ran about 20 *l.* of a brownish water or *Serum*; one of the *Vesicles* hereafter mentioned being pierced. Where to enter my knife next, I was almost at a stand, her belly being as yet, scarce at all lessened.

Having separated the *Muscles* of the *Abdomen*, I found no *Serum* or *Hydropick* Water therein; but a heap of Bladders, of several sises, presented themselves. From the greatest whereof, being pierced, there issued above 20 *l.* more of a brown and thickish *Serum*, *tinctur'd* with a *Sediment* of the colour of *Umber*. Some of the lesser were about the bigness of a Childs head; which yielded a slimy *Serum*, in consistence and colour, like the *Mucilage* of *Quince* Seeds. Others were much less, some as big as a mans fist, some as an ordinary Apple, and some as a Walnut. In most of which was conteined a *Serum* like to the White of an Egg. in some of them, much less *viscous* and somewhat white, like Starch newly boyl'd.

At the length I perceived, that all these Bladders were parts some way relating to the Womb. Wherefore having seperated the *Ossa Pubis*, I took out the Womb, with the *Pudendum*, and parts appendent all together. And then, amongst other particulars, observed, That the right *Testicle* or *Ovary* was but small, white, and its *Vesicles* in a manner dryed up. But the left to be swell'd into a Vast bulk: The aforesaid Bladders, in one of which were contained so many pounds of Liquor, being nothing else originally, but the Eggs belonging to this left *Ovary*. Imagine you saw about 40 Bladders, some of a little Pig, others of a Hog, or a Calf, and some of an Oxe: all distended with Liquor, and ty'd, like a Reeve of Onions altogether, and you have also seen this *Ovary*.

The *Testicle* or *Ovary* it self, all the *Serum* being exhausted, weighed (together with the Womb, which was but light) 25 *l.* Out of all the said *Vesicles* or Bladders together, were exhausted above an hundred & twelve pounds of *Serum*. Thus for the Authors own Observations.

The History of the Child that was found in the Mothers Belly out of the Womb, published in the Transactions last foregoing, sc. Num. 139; and this of the *Hydropick Testicle*; may be two Argnments, further to satisfy those who have hitherto doubted of the Female *Testicle* its being an *Ovary*. The former proving the *Vesicles* thereof with the Humor or Humors they contein, to be the Eggs out of which the *Fœtus* is bred. Which as they are used to enter into the Womb by the *Fallopian Tube*: So in this case, it is most likely that the Egg falling off the *Ovary* into the said *Tube*, by some preternatural contraction of its lower *Orifice*, was stopped from issuing thence into the Womb. Yet being, it seems, near enough to receive the Vital Contact, It thereupon began to be enlarged; and so, by reason of its own increasing Bulk, was made gradually to slip back again towards the upper and larger *Orifice* of the said *Tube*, and at last, to drop thence into the Cavity of the *Abdomen*; which now, instead of the Womb, became its Nest.

This latter History of the Hydropick *Testicle* sheweth, That it is possible for the said *Vesicles* or Eggs, to be enlarged, upon Conception, as much as is necessary for the

Generation of a Child: That is to say, when within the Womb, as much as they were here, upon the *Ovary*. So that it is not, I conceive, reasonably to be doubted, but that the *Membranes*, which we call the *Secundine* or After-Birth, are the *Individual* ones, which belong to that *Vesicle* or *Egg* which falls from the *Ovary* into the Womb: Being therein, with their conteined Humor, naturally augmented and amplified, as here they were preternaturally, in this Hydropical Case.

Microscopical Observations of the Structure of Teeth and other Bones: Made and Communicated, in a Letter by Mr. Anthony Leeuwenhoeck.

I Have some time since applyed a Glass, (esteemed by several Gentlemen, who had try'd it, a very good one) to observe the Structure of the Teeth, and other Bones. Which both to them and my self also, then seemed to consist of *Globules*. But since then, having drawn out one of my Teeth, and for further Observation, applyed better Glasses than the former; the same Gentlemen, with my self, agreed, from what we plainly saw, That the whole Tooth was made up of very small strait and transparent Pipes. Six or seven hundred of these Pipes put together, I judg exceed not the thickness of one Hair of a Mans Beard. In the Teeth of a Cow, the same Pipes appear somewhat bigger, and in those of a Haddock somewhat less.

Fig. 1. *Fig.* 2.

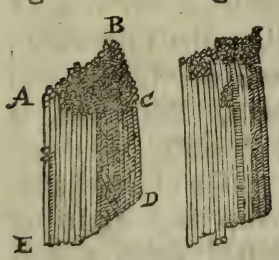


Fig. 1. *A. B. C. D. E.* is a Square piece of a Bone, whereto, although you apply a good *Microscope*, yet at the end *A. B. C.* it will seem as if composed of *Globules*. Nor will the Pipes distinctly appear on the sides *A. C. D. E.* by reason of the thickness of the Bone, and thereby the trajection of less light.

Fig. 2. Is a flat piece of a Bone, in which the aforesaid Pipes may be seen.

I have also observed part of the Shin-Bone of a Calf six or eight weeks old. In which the said Pipes are less strait than in a Tooth. And sometimes there seemed to be several lesser

Pipes

Pipes joyned together, so as to constitute one greater. Yet these Pipes were very full, which hindred my better observation of them. And I am apt to think, that there was one sort of Pipes different from the former, which are continued from the Centre of the bone, towards the circumference, as the Insertions do in the Wood of a Plant. But I doubt whether I shall be able hereafter more distinctly to discover these last said Pipes, because I cannot handle the Bone after my own pleasure.

BRITISH MUSEUM NATURAL HISTORY

Fig. 3.

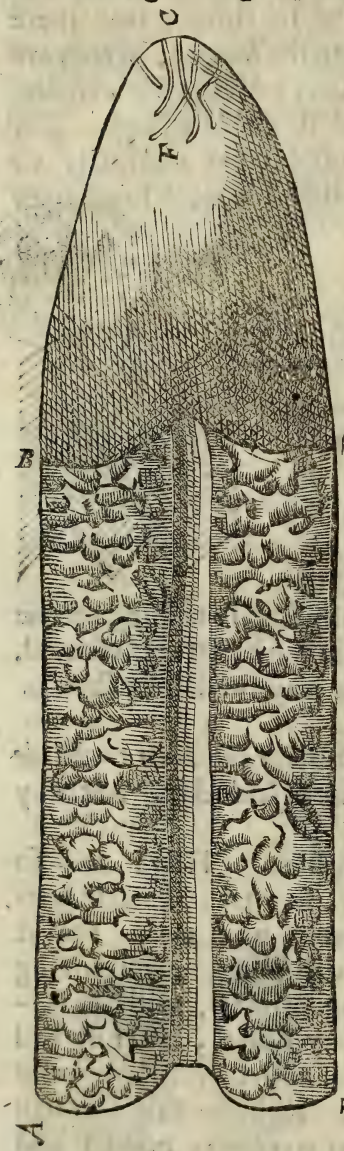
Of The Grain of Ivory.

THe Author of these Transactions hath often taken notice of the Grain of *Ivory*; and is that which, upon a due position to the falling light, is visible to a naked Eye The several pieces whereof it is composed, appearing like the *Fibres* or *Threds* of a *Muscle*, running in parcels, *decussatim*, and under and over one another reciprocally; and so making up one Piece of Platted Work: as in Fig. 3 is in some part represented. And as hereafter, & in another place may further be shew'n.

Microscopical Observations of the Structure of Hair: Made also and Communicated by the aboveſaid Mr. Anthony Leeuwenhoeck.

I Have formerly examined the Structure of Hair; and so much as I thought I saw my self, shewed to certain learned Gentlemen; who then all agreed with me, that it consisted wholly of *Globules*. As did also to my thinking the Hoof of an Elk. But not being satisfied, without further inquiry; I took the Hair of my Beard, after it had been shaved the first, second, third, and fourth days, and observed, That the little particles which we saw through the common *Microscopes* (which yet were very good) and which appeared round, were indeed irregular, and lay very closely pressed one upon another. Of these particles consist the outer parts, or *Cuticle* (or, as the Author calls them, *Clods*) of the Hair. One of these Hairs I met with, which seemed rare, being on the one side convex, on the

other somewhat concave, and looking like two Hairs continuous or growing together; as is represented by this Fig.



A. B. Is about a dayes growth & half out of the skin. Betwixt *A. B.* and *D. E.* are the irregular particles which make the Clods of the Hair. These irregular particles I judg to be at first *Globular*; but as the Hair grows, to lose their original Figure. *B. C. D.* is the Cut the Barbars Rasor had made in shaving.

Prosecuting this enquiry, I try'd also to observe these *Globules* or little particles in the end of the Hair cut transversely, thereby to compute how many of them were conteined in some small part of the Hair. But I found that the structure of the iner part of the Hair, did not agree with that of the outside or Clods.

I then examined the Roots of several Hairs, plucked out of my Hand, Nostrils, Eye-lid, Eye-brow, and other parts, and clearly saw, That the whole Root, except the Clods, consisted of little Strings, which I suppose to be Veins or Vessels. And I have shew'd the Root of a Hair with all its *Fibres*, so plainly, as if before our Eyes, we had seen lying a common Tree with all its Roots: except that these Fibres in the Root of a Hair, were all of a thickness.

Proceeding further, I likewise very clearly discern'd, that the whole Hair, except the Clods, consisted of little Strings,

Strings, whereof there were about a thousand in one Hair more or fewer, according to the thickness of the Hair Whether these Strings are hollow, *i.e.* so many Pipes or Vessels, I cannot positively say, but it seemeth to me that they are. So that I conceive we may not unfitly compare the Clods of the Hair (consisting of the aforesaid irregular particles) to the Bark of a Tree; and the little strings which compose all that part of the Hair within the Clods, to the Pipes which make the Wood.

These Strings, or if you please, Pipes, do not lie every where stretched out in a straight line, but in some places are somewhat crooked, as at *F*.

I have also shewed several Gentlemen the Brisles of a Hog; and therein (being cut over thwart with a sharp knife) the said Strings, very distinctly: which likewise seemed to be hollow.

Extract of a Letter written by Signior Borelli, *about the price of his Telescopes: Communicated to Sir* Jonas Moore.

THe said worthy person saith, that although he did not at first intend any more than to present his Glasses to some of the most famous Astronomers; yet being earnestly sollicited by his Friends from many parts, he offers to rate the price of them, according to what the most known Artists, such as *Campani* and *Divini*, have done, who both have commonly sold their Glasses at the rate of a Pistol (*i.e.* about 17 shillings and six pence) the foot. But if any Glass hath proved extraordinary, they have trebled and quadrupled that price. He saith further, that he had seen one of *Divini*'s of 12 foot, which was sold for 400 *Livers* (*i.e.* about 30 *l.* Sterling.) And that *Campani* sold another of 34 feet, for 2000 *Livers* (*i.e.* about 150 *l.* sterling.) Notwithstanding which, he is willing to part with the best of his own Glasses of 50, 60, or 65 feet for 500 (*French*) *Crowns* (*i.e.* about 112 *l.* and 10 *s.* sterling) which is less than the price of the forementioned Glasses of 34 feet. And for the small Glasses, he will let them go from 6 to 12 foot, at a (*French*) Crown a foot; from 12 to 17 or 18, at half a *Pistol*; from 18, to 26, at a *Pistol*.

A

A New Invention of a Clock ascendent on a Plain inclin'd: By Mr. De Gennes, *an Officer belonging to the Sea. Extracted out of the Journal* Des Scavans.

WE have formerly seen Clocks, that never go, but when they are applied upon a Plain inclin'd. But we never yet saw any Clocks that wind up again of themselves upon the same Plain. There is to be seen in Mr. *Cospi's* Study, a Wooden Wheel, which works the same effect upon a Plain Inclin'd, invented by Mr. *Bondoni*, a *Florentine* Secretary to the said Marquis. But in regard M. *Legati* doth not unfold this secret; and for that M. de *Gennes* having found out the same, hath succesfully apply'd it to a Clock; the manner hereof, which he communicated unto me, I shall here impart.

Fig. 5.

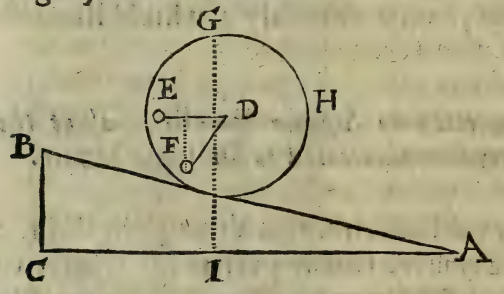
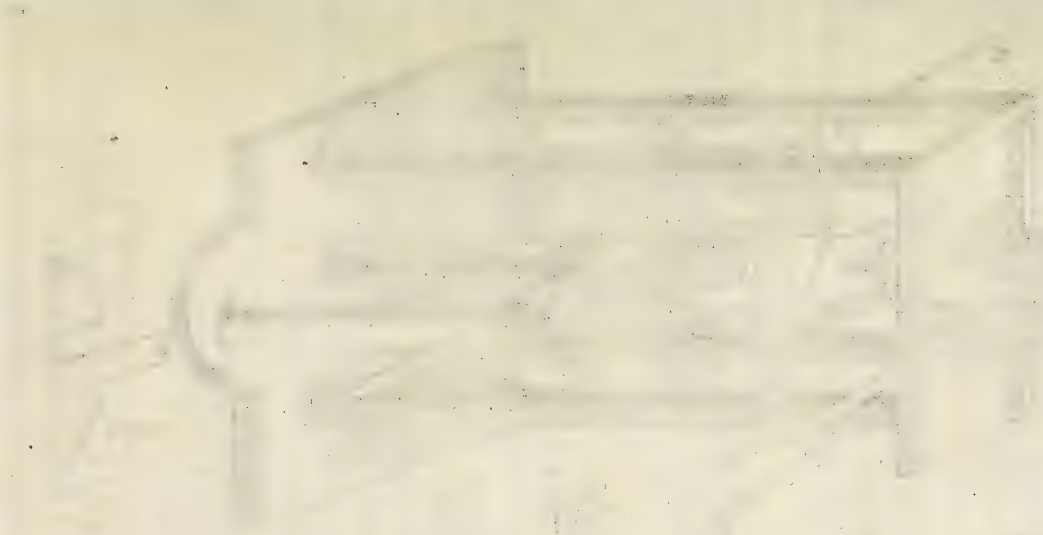


Fig. 5. represents the inside of the Machin placed upon a Plain Inclin'd. The whole Invention consists in a Weight, which causes the Machine to play after the following manner.

The Circle *F G H* being placed upon a Plain Inclin'd, *A B* is divided into two unequal parts by the Line *G I*. To restore to the least Secture its equilibrium there is fastned to the extremity of the *Radius D F*, a Weight *F*. which is sufficiently heavy to recover what the lesser Secture loses by its situation, That a Wheel or Clock may thus stand not only in equilibrium, but also ascend upward, there is placed in the middle of the Clock a Drum, which encloses the spring of the Pendulum, upon which Drum is fasten'd the Radius *D F*. For thus the spring being mounted, enforces the Drum to turn, and so to raise the Weight, which it cannot raise, without its becoming more heavy, in regard that coming to the point *E*. it is farther from the Centre, than when it was in *F*. and thus all the Wheel turns on that side as the spring gives way.

M. de *Gennes* doth not here give direction how the Wheels that compose the Clock are to be made, because there



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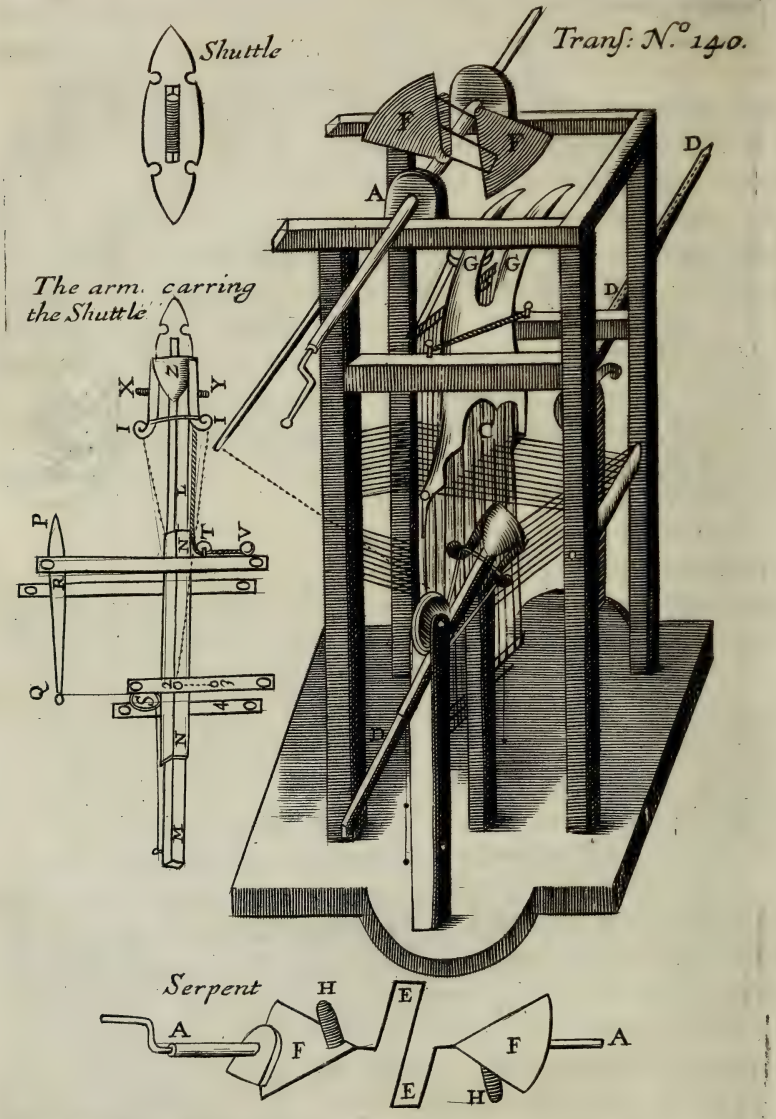
NATURAL HISTORY


Shuttle
Transf: N.° 140.
The arm carring the Shuttle
Serpent
A
F
H
E
D
G
I
X
Z
T
N
L
M
P
R
Q
S
O

that no Clock-maker that doth not understand how to apply the force of a spring to the motion of a Clock.

A New Engin to make Linen-Cloth without the help of an Artificer, presented to the Royal Academy, by Monsieur de Gennes, *an Officer belonging to the Sea. Extracted out of the Journal de* Scavans

THis Engin is no other than a Mill, to which are apply'd all the parts of a Weavers ordinary Loom.

This Mill is composed of four principal parts, that is to say, the Serpent *A A*, two Footsteps or Treddles *B B*, one Clapper *C*, and two Arms *DDDD*.

The Serpent or Iron Barr *A A* has two Elbows *E E*, whereto the ends of the Ropes are fix'd that raise and put down the Foot steps *B B*. *F F* are two fourths of a Circle, that successively rest upon two Arches or Bows of Iron *G G*, which are above the Clapper *C*. to raise it. *H H* are two Teeth of Iron, added to the Serpent making an Angle of 25 degrees with *F F* and *K K*, which serve to put down a *Bascule* or *Sweep* which is in the Arm that carries the Shuttle. The Footsteps or Treddles differ in nothing from those which are usually made use of, only the Cords that hold them pendent from the ground are fixed in the Elbows of the Serpent, which in turning raises and puts them down by the help of two little pullies, upon which the Ropes turn.

The Clapper is supported between two Pillars with a Rope double twisted, which makes it to make a kind of a Spring, and causes it naturally to give forwards to beat the Cloth.

L M is one of the Arms which pass freely into the Canal or Pipe *N N*, supported by four Pillars of Wood *OOOO*. The Motion of it proceeds from the following Parts. *P Q* is a *Bascule* which, though unequally divided by its supporter *R*, is yet in *Equilibrio*, the end *P R* being made to weigh exactly as much as *R Q*.

At the Extremity of this *Bascule* is ty'd a Cord which passes through the Pully *S*, and terminates at the Extremity of the Arm, where it is fastned to a little *Bowle M*. At the other Extremity of the same Arm that is to say towards *L*, is

also fastned underneath a Cord, which passes through the Pulley *T*, and which carries the weights V.

At the same end of the Arm is added a little *Niche Z*, about the bigness of half the Shuttle: then over a little Barr *X Y*, which passes athwart the Arm, there are two other little peices of Wood having at the end of them two teeth, which enter into the *Niche Z* through two holes which are there of the one side and t'other.

To the ends of these little peices of Wood there is a little bow of whale-bone or Steel, which keeps the two ends asunder, and forces the teeth, which are at the other end, to enter into the *Niche*, before the said peices can themselves. At the Points 11. are two Ropes, that pass through the pullies 22. fastned to the Pillars 0. 3. 0. 4. and have each of them a little weight at the end big enough to keep it from passing through a little *Bowl* which is under each Pulley.

This Arm thus disposed goes and comes in the hole *N N* in the following manner. One Tooth of the Serpent already described, strikes upon the Extremity of the *Bascule P Q*, and so causes the end *Q* to rise up, which drawing the Cord fastned to the Point *P M*, makes the Arm *L M* to advance forward. But when afterwards the tooth of the Serpent is come forth again, then the Weight *V* ty'd to the other end of the same Arm by a Cord, that passes through the Pulley *T*, forces the said Arm by its own Weight to return again.

When the Arm *L M* is in its ordinary place, the 2 little pieces of Wood, into which enters the Bar *X Y*, enclose the Shuttle by means of the Whale-bone Spring. But when the said Arm approaches the other opposite Arm, then the cords ty'd to the point 11, being a little too short, and the Weight which is at the end of them not being able to pass through, the Spring gives way a little, and so the Shuttle is no longer enclosed by the Arm which carries it, but is wholly received and grasped by the other; which likewise in its turn delivers it back again, in the same manner.

The Motion of the whole Machine is made at the rate as you move the handle of the Serpent, for then the Arms cause the threads to open, and immediately one of the Arms begins to slide in towards the opposite Arm, to which it

carries

carries the Shuttle and retires, immediately. At the same time one of the Quarters of a Circle, which held the Clapper elevated, forsakes it, and leaves it to flap, and then the opposite Quarter of a Circle elevating it self, the other Elbow changes the threads, and the other Arm retires, and so successively.

The advantages that may be drawn from this Engin above the ordinary Looms to make Linen Cloth are these; 1. that one Mill alone will set 10. or 12. of these Looms at work. The Author has also a way to stop one, for the tying a knot in any thread, while the rest go. 2. You may make the Cloth of what breadth you please, or at least much broader than any which hath been hitherto made, in regard the Arms will play to what extent you desire. 3. There will be fewer Knots in the Cloth, since the threads will not break so fast as in other Looms, because the Shuttle, that breaks the greatest part, can never touch them. In short, the Work will be carried on quicker and at less charge, in regard that instead of several work-folks, which are required in making of very large Clothes, one boy will serve to tie the threads of several Looms as fast as they break, and to order the Quills about the Shuttle,

The Author hath also an easy way so to order it, that the Cloth shall give way of it self, as fast as it is made.

A Relation of a Worm Voided by Urine; Communicated by Mr. Ent: *to whom it was sent by Mr.* Matthew Milford.

THe Worm when I voyded it, which was at the second Urine, was then alive. It was Snake-headed, of indifferent substance in the middle, and small at the tail. In length above half a yard. I was very ill before it came from me, and have ever since urin'd a kind of blood.

This Relation is here set down in the Patients own words. 'Tis most probable he had had a Suppression of Urine for some time, at the first making whereof the Worm was Voided from one of the Kidneys (wherein it was bred) into the Bladder; and at the second, from thence into the Por.

The Worm being dead and dry, was of a dull red colour, and in thickness about the 12th. of an Inch.

An Essay tending to make a probable Conjecture of Tempers and Dispositions by the Modulations of the Voice in ordinary Discourse. Communicated also by the forementioned person.

SItting in some Company, and having been but a little before Musical, I chanc'd to take notice that in ordinary discourse words were spoken in perfect Notes, and that some of the Company used Eights, some Fifths, some Thirds: and that his Discourse, which was most pleasing, his words, as to their Tone, consisted most of Concords; and where of Discords, of such as made up Harmony. The same person was the most affable, pleasant, and the best natured in the Company.

This suggests a Reason, why many Discourses which one hears with much pleasure, when they come to be read scarce seem the same things. So one whose pronunciation is not affectedly, but naturally musical, we term well-spoken: whereas another may speak as good Wit or sense, and yet not have half the acceptance.

From the difference of Musick, in Speech we may also conjecture that of Tempers. We know, the Dorick Mood sounds Gravity and Sobriety; the Lydian, Buxomness and Freedom; the Æolique, sweet Stilness, and quiet Composure; the Phrygian, Jollity and Youthful Levity; the Ionique is a stiller of storms and disturbances arising from passion. And why may we not reasonably suppose, that those, whose speech naturally runs into the Notes peculiar to any of these Moods, are likewise in Nature hereunto congenerous?

So also from the Cliff, as he that speaks in Gamut, to be manly, *C Fa Ut*, may show one to be of an ordinary Capacity, tho good disposition. *G Sol Re Ut*, to be peevish and effeminate, and of a weak and timerous Spirit. Sharps an effeminate; Flats, a manly or melancholick sadness. He who hath a voice which will, in some measure, agree with all Cliffs, to be of good Parts and fit for variety of Employments, yet somewhat of an inconstant Nature. Likewise from the Times; so Semibreifs may speak a Temper dull, and flegmatick; Minums, grave; and serious Crochets, a prompt Witt; Quavers, vehemency of Passion, and Scolds

use

uſe them. Semibreif-Reſt may denote one either ſtupid, or fuller of thoughts than he can utter; Minum-Reſt, one that deliberates; Chrochet-Reſt, one in a Paſſion; So that from the Natural uſe of Mood, Note, and Time, we may collect Diſpoſitions.

An Account of ſome Books Extracted out of the Journal des *Scavans*.

I. *Muſeo Coſpiano anneſſo a quello del famoſo Uliſſe Aldrovandi et donato alla ſua Patria dall' Illuſtriſſimo Signore Ferdinando Coſpi Patricio di Bologna & Senatore, &c. Deſcrizzione di Lorenzo Legati Cremoneſe In fol. In Bologna.* 1678.

MR. *Ferdinand Coſpi* Marquis of *Petreoli*, equally illuſtrious for his Merit, the Employments wherewith he is honoured in the Court of *Tuſcany*, and for his extraordinary Learning, which hath rais'd him to one of the higheſt degrees in the *Academy* of the Gelati in *Bononia* (no leſs famous than that of the Humoriſts at *Rome*) having with extraordinary care and expence, made a Collection of whatever he ſaw there that was curious and rare, and beſtowed it upon his Countrey, the Senate of *Bononia* hath added the ſame to that of *Aldrovandus*. An ample and learned Deſcription whereof is here made by Mr. *Lorenzo Legati* Philoſopher, Phyſician, and Greek Profeſſor in the Univerſity of *Bononia*

He divides the Work into Five Books.

The firſt contains a Deſcription of whatever this Muſæum hath of rarity concerning Mummies, Beaſts, Serpents, Birds and Humane Monſters, in reſpect as well of the inward as the outward parts: as the Child born at *Bononia*, in *Apr.* 1660. with two heads and two pair of Lungs, yet dy'd within an hour after it was born.

The ſecond Book conteins the Deſcriptions and other Remarks of ſeveral rarities concerning Aquatiles, as of the Flying Fiſh, &c, As alſo of Corals, Pearl, &c.

The

The ſubject of the third Book, are Works of Art. There being in this *Muſæum* ſeveral Volumes of different Paper, and writing. Divers Mathematick and Phyſical Inſtruments. Together with the ſeveral kinds of Weapons and other Inſtruments of War. Upon occaſion of which latter, the Author diſcourſes at large of the Original of War, and of every Engine and Weapon in particular made uſe of in an Army.

There are here alſo divers Sepulchral Lamps of the Antients. The Fire whereof the Author of the aboveſaid Journal well obſerves, that it was no otherwiſe perpetual, than that of the Veſtals, which they took care to feed every day with freſh ſupplies of nouriſhment. Which is alſo confirmed by one Article of *Mævia's* Will reported in *L. Mævia* 44. ff. *de Manumiſs. Teſtament* in theſe words ſc. I do affranchiſe *Saccus* my Slave, and *Eutychia* and *Irene* my Servants, on condition that every one of them in their turn, from moneth to moneth, ſhall repleniſh the Lamp with Oyle that burns in my Sepulchre.

The Fourth and Fifth Books are concerning the Medals and Gods of the Antients: Of which a further account is promiſed hereafter.

II. *Syſtema Bibliothecæ Collegii Pariſienſis Soc. Jeſu. In* 4 *A Paris chez Sebaſtien Mabre-Cramoiſis* 1678.

OF which Library the Author of the ſaid Journal ſaith, that it conteins above two and thirty thouſand Volumes.

III.

III. *Glossarium ad Scriptores mediæ & infimæ Latinitatis, in quo Latina Vocabula novatæ significationis explicantur; complures ævi medii Ritus & Mores, Legum, Consuetudinum Municipalium, & Jurisprudentiæ recentioris formulæ & obsoletæ voces, utriusque Ordinis Ecclesiastici & Laici Dignitates & Officia,* &c. *enucleantur & illustrantur, innumera denique Scriptorum loca Græcorum, Gal. Lat. Ital. Hispan. German. Anglo-Sax. expenduntur, emendantur, elucidantur. In fol.* 3. *Vol. Autore Carolo du Fresne Domino du Cangi Regi a Cons. & Franciæ apud Ambianos Quæstore.* A *Paris chez Louis Billaine rue* S. *Jacques devant les Mathurins.* 1678.

THis Glossary of *M. du Cangi*, which is now compleated, for the merit of the Author, the subject treated of, and for the Brass Cuts therein, is a Work so considerable, that the Learned will not be offended with this Advertisement. For which a very great number of Authentick Writers, as well in *M. SS.* as in Print, were consulted. The work conteins above two thousand Observables; together with several Learned Dissertations upon divers curious and profitable Subjects.

IV. *Explication Novelle & Machanique des Actions Animales, ou il est traite des fonctions de l'Ame,* &c. *Par. M.* Duncan *D. en Med. In* 12. *a Paris chez le meme.* 1678.

BEcause the Knowledg concerning the Functions of the Soul, and Animal Motions, dependeth much upon that of the Construction of the Brain: This Author therefore teaches the Dissection hereof, after such a manner, as seems more natural than that of *Sylvius*, *Bartholine*, or *Willis*, although they have all done excellently well. In this Dissection, having laid bare the Vertebral Artery of a Living Animal, and made an Incision

cision therein big enough ro receive the end of a Syringe; he then makes several Injections into it, either of Mercury, or of melted Wax mixed with Oyl of Turpentine, till the Jugular Veins are colour'd therewith: and so presently makes a Ligature upon those Veins: whereupon you shall have the pleasure to see the branching and distribution of the Carotick and Vertebral *Arteries*, and of the Jugular Veins; together with the Communication that is between them all.

That you may distinguish, in the twinkling of an Eye, the Arteries from the Veins; he begins his Injection through the Jugular Veins, having before emptied them of the blood, after he hath made a Ligature on the Carotick Arteries.

Note, that this is the whole account given by the Author of the aforesaid Journal.

LONDON,

Printed for *John Martyn*, Printer to the *Royal Society*. 1678.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *September*, *October*, and *November*, 1678.

The Contents.

Monsieur Cassini's *Observation of the Lunar Eclips on the* 29 *Octob.* 1678. *Monsieur* Gallet's *Observation of the Solar Eclips on the* 11 *June*, 1676. *Extract of a Letter from Monsieur* Butterfield *about the making of Microscopes, &c. Extract of a Letter from Mr.* Conyers *about his Improvement of Sir* Samuel Moreland's *speaking Trumpet. An Account of two Books:* I. *A Discourse of the State of Health in* Jamaica, *&c. by Dr.* Thomas Trapham. II. Catalogus Stellarum Australium: *by Mr.* Edmund Halley.

Clarissimo Viro
Domino Nehemiæ Greuio Regiæ Societatis à Secretis
Jo. Dominicus Cassinius S. P. D.

CUM nupera Lunæ Eclipsis à nobis hîc in observatorio regio diligentissime fuerit observata, ejus exemplar ad te, Vir Clarissime, mittendum duxi regiæ Societatis Astronomis, imprimisque D. Flamstedio, *communicandum. Inserviet illa Meridianorum differentiæ* Parisios *inter &* Londinum *exactè definiendæ, si vobis par cæli serenitas ejusdem observandæ opportunitatem obtulerit, &c.*

Observatio Lunaris Eclipsis die 29 Octobris 1678.

Phases lunæ & macularum secundum denominationem Riccioli.	*In observatorio Regio*				*In Collegio Claromontano.*	
	Infra		*Supra*			
	h ′ ″		h ′ ″		h ′ ″	
Incipit Umbra	6 43 30		6 43 40		6 43 54	
Grimaldi lymbus sequens	45 0				45 29	
Gallileus	46 0		46 0			
Finis Gallilei	47 0					
Mersenus	48 20					
Chorda Eclipsis dig. 6.			49 0			
Gassendi initium	50 50		50 50			
Gassendi medium			51 30		51 37	
Schikardi initium	51 43					
II. digiti Ecliptici			52 0			
Aristarchi initium	52 50					
Aristarchi medium			53 10		53 7	
Morinus						
Aristarchi & Morini finis	54 0					
Capuanus sive oculus draconis	56 0					
Digiti III.			56 30			
Chorda 9 digitorum			57			
Initium terræ pruinæ & Copernici	58 54					
Copernici initium			59 10			
Copernici medium	7 0 0		7 0 0		59 39	
Copernici finis	7 0 55		7 0 55			
Pitheæ initium	7 1 50		7 1 40			
Pitheæ finis	2 30					
Caput Virginis	2 45		2 40		7 3 18	
Harpalus	2 55					
Tychonis initium	4 20		4 20			
Tychonis medium	5 0				5 48	
Tychonis finis	5 55					
Eratosthenes	6 20					
Digiti V.			6 50			

Pro-

	h	′	″	h	′	″	h	′	″
Promontorium inter Virginem & Platonem	7	7	0						
Insula in ultimo sinuum mediorum		7	30						
Clara sequens Tychonem		8	31						
Digiti VI.					11	20			
Tymocharis		11	48						
Platonis initium					13	20		13	29
Platonis medium					13	40			
Platonis finis & initium Manilii		14	0						
Platonis finis					14	40			
Manilius					14	50		15	4
Finis Manilii		15	12						
Dionysii initium		17	15						
Dionysius					17	25			
Menelaus					18	10		17	59
Dionysii finis & Menelai initium		18	28					18	11
Plinius incipit	7	20	56						
Plinius				7	21	10	7	21	51
Picolomineus seu clara supra annulum		21	30						
Initium fracastorii seu annuli		23	0		23	5			
Initium Possidonii		23	55					24	38
Finis fracastorii		24	25						
Clara ante angulum promontorii acuti					24	45			
Angulus promontorii acuti		25	10						
Digiti IX,					26	10			
Palus Somni		28							
Initium Endimionis		29	20						
Initium Taurentii		30	30						
Angulus cornuum cum parallelo 77 15					30	40		31	16
Hermetis initium		31	5						
Finis Taurentii sive capitis Serpentis		31	40						

	h	′	″	h	′	″	h	′	″
Hermetis finis	7	32	0						
Proclus		32	20						
Lymbus maris Caſpii		32	29		33	3		33	10
Macula Inferior		33	5						
Initium Langeni		34	24						
Meſſala		34	40						
Finis Langeni		35	40						
Peninſula in Caſpia		37	50						
Finis Caſpiæ		37	50		37	50		38	18
Macula oblonga f.		39	16						
Finis		40	41		41	0		41	41
							ſubtrah		13′
Initium emerſionis	9	21	30	9	21	30		21	5
Grimaldus		22	44					22	10
Grimaldi finis		23	40		23	40			
Gallileus		24	35						
Mare humorum		28	15						
Schikardi medium		29	0						
Ariſtarchi initium		29	44					29	41
Ariſtarchi medium					30	20			
Ariſtarchus totus		30	25						
Gaſſendus totus		31	0						
Kepleri initium					31	40		31	6
Keplerus totus		32	24						
Morinus		30	0						
Finis inſulæ Kepleri		34	22						
Capuanus totus		34	40						
Initium terræ pruinæ		35	43						
Virgo		37	0						
Aura inter Pitheam & Keplerum					37	20			
Harpalus & clara ante Copernicum	9	37	34						
Digiti III.					37	40			
Bullialdus		38	30						
Initium Copernici					39	0		38	36
Tychonis initium		40	0					40	22

	h	′	″	h	′	″	h	′	″
Copernicus totus	9	40	18						
Pitheas					40	30			
Tychonis medium		41	0		41	10			
Tychonis finis					42	10			
Digiti IV,					42	40			
Tymocharis totus		45	30						
Plato incipit					45	30		45	0
Digiti V.					47	0			
Plato totus		47	0						
Plato totus					47	30			
Insula sub sinu medio		50	0						
Finis sinus medii		50	50						
Archimedes		51	37						
Digiti VI.					52	0			
Manilius					54	0		53	52
Fretum		54	22						
Abifeldeæ initium		54	40						
Abifeldeæ finis		55	30						
Aristoteles & Eudoxus toti		56	0						
Digiti VII.					56	20			
Dionysii initium		57	12						
Menelaus		57	50		57	40		57	16
Dionysii medium					58	30			
Menelaus totus		59	0						
Dionysius totus	10	0	0						
Digiti VIII.	10	1	30						
Ostium lacûs mortis				10	2	0			
Plinius					2	15	10	1	28
Promontorium supra Dionysium		3	0						
Plinii finis Possidonius		3	40						
Promontorium acutum					5	30			
Hermes		6	0						
Digiti IX.					6	15			
Chorda umbræ 8 digitorum					9	30			
Messala		11	0						
Initium maris Caspii		13	30		12	10		11	30
Langrenus totus		16	0						

Chorda

	h	′	″	h	′	″	h	′	″
Chorda ſex digitorum	10			14	0				
Caſpii prior finis				16	50		16	44	
Caſpii alter finis	17	33		17	25				
Albedo in mari Caſpio	18	15							
Finis totalis	20	0		20	10		20	42	

Monſieur *Gallet*'s Obſervation of the Solar Eclips on the 11*th* of *June*, 1676.

Obſervatio Solaris Eclipſis Acta Avenione die 11. *Junii* 1676.

Ante Eclipſin.

DIEBUS præcedentibus, locum aptiſſimum elegimus in quo aëre puro frueremur, videlicet Conventum RR. PP. *Carmelitarum diſcalceatorum, qui reſpectu Civitatis Aven. ad ortum vergit & mœnia ſtringens aëre, fumo & vaporibus urbanis libero gaudet; in medio horti cameram obſcuram tapetibus conſtruximus, & in eâ inſtrumenta ad obſervationem neceſſaria ritè collocavimus.*

Tuboſpicillum aptavimus lente oculari concavâ & objectivâ convexâ inſtructum, duplicem habens motum firmo ſuſtentaculo, verticalem ſcilicet & horiſontalem, affixam tabellam immobilem firmatis cochleis ſecum circumducens oculari vitro ſemper parallelam chartâ candidiſſimâ indutam, in qua ſolarem ſpeciem, diſtantiâ tuboſpicilli determinatam deſcripſimus, hujus diametrum circulis concentricis in duodecim digitos diviſimus, & quemlibet digitorum in partes ſexageſimas.

Loco quadrantis qui pluribus indiget cautionibus & nimium obnoxius eſt vacillationibus, in hac præcipuè regione in qua ferè ſemper ſpirat Aquilo qui perpendiculum agitat, Gnomonem ad captandas umbras Solis in partes 400. *optimè diviſum diſpoſuimus ita ut liberè moveretur ſitum verticalem ope perpendiculi conſervans. Tandem horologium rotatile minuta prima & ſecunda indicans motu penduli cum cycloide præparavimus.*

Tempore

Tempore Eclipſis.

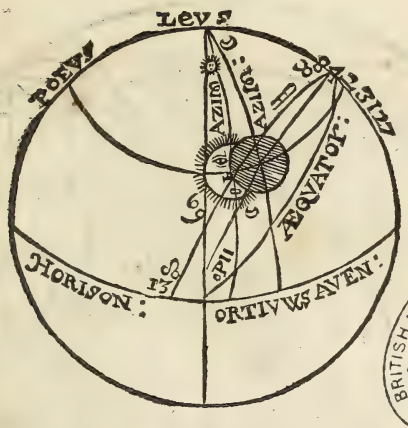
IPSA die Eclipſis undecimâ Junii horâ unâ circiter poſt ortum Solis, uſque ad initium & finem Eclipſis, ſpeciem ejus lucidam infrà deſcriptam in charta, ſine intermiſſione recepimus & quilibet ex nobis inſtrumento ſibi deſtinato ſemper invigilavit; Dominus de Beauchamps Muſarum Avenionenſium Mœcenas ampliſſimus, Ego quoque cum illo, tuboſpicillo; Dominus de S. Florent viſûs perſpicaciſſimi, Gnomoni; Dominus Moutonier horologio, unà cum Domino Marin Presbytero in mathematicis, & præſertim horologiis verſatiſſimo.

Statim ac ſenſibiliter cœpit umbra diſcum inire, quantitatem partium obſcuratarum, umbram in partibus Gnomonis & horam horologii notavi è directo primæ phaſis, & ita collegi phaſes 39, contentas in ſequenti tabella, non omiſſo tempore quo fuerunt cornua Solis verticalia & parallela horiſonti, & quo cornu occidentale ſub eodem fuit verticali cum centro Solis.

Nam

Num. Plan.	Digiti obscur.		Umbra Gnomon. in partibus qualium Gnomen continet		Altitudo Solis apparens.			Altitudo Solis vera.			Hora Horologii penduli.			Hora correcta per altitudinem Solis.			
1	D.	M	400.		G.	M.	S.	G.	M.	S.	H.	M.	S.	H.	M.	S.	
1	0	27	561		35	29	23	35	28	48	7	50	31	7	50	34	
2	1	0	536		36	44	0	36	43	28	7	57	25	7	57	28	
3	1	30	520		37	34	7	37	33	37	8	2	3	8	2	7	
4	3	0	478		39	55	23	39	54	57	8	15	14	8	15	13	
5	3	25	466		40	38	30	40	38	6	8	19	0	8	19	14	
6	4	30	438		42	24	14	42	23	53	8	29	19	8	29	6	
7	4	40	434		42	39	58	42	39	37	8	30	59	8	30	34	
8	5	0	424		43	19	53	43	19	32	8	34	34	8	34	18	
9	5	30	412		44	9	12	44	8	52	8	39	19	8	38	56	
10	6	0	394		45	10	57	45	10	39	8	44	54	8	44	44	Cornua verticalia.
11	6	40	375		46	35	50	46	35	33	8	53	19	8	52	45	
12	6	50	371		46	54	15	46	54	0	8	54	54	8	54	31	
13	7	0	366		47	17	30	47	17	14	8	56	44	8	56	44	
14	7	20	350	2/-	48	30	37	48	30	23	9	3	44	9	3	44	Maxima obscuratio.
15	7	8	339	1	49	20	10	49	28	58	9	9	14	9	9	15	
16	7	0									9	11	0				
17	6	35	321		51	39	22	50	39	10	9	15	54	9	16	12	
18	6	25	325		50	0	12	51	0	0	9	18	14	9	18	11	
19	5	25	296	3/4	53	10	29	53	10	19	9	31	5	9	31	1	
20	5	0	286	-/1	53	55	14	53	55	5	9	35	44	9	35	30	
21	4	40	283	-/5	54	27	6	54	26	57	9	38	39	9	38	43	
22	4	35		5/2							9	42	3				Cornua parallela Horisonti.
23	4	0		-/-							9	47	19				
24	3	53	266	3/1	56	3	35	56	3	27	7	48	45	9	48	36	
25	3	35	262	-/-	56	28	29	56	28	22	9	51	29	9	51	11	
26	3	30	262	2	56	37	32	56	37	25	9	52	11	9	51	59	
27	3	26	260		56	43	34	56	43	27	9	52	34	9	52	45	
28	3	6	254	2/-	57	15	59	57	15	53	9	56	5	9	56	10	
29	3	0		3							9	57	40				
30	2	48	249	1/-	57	50	48	57	50	42	9	59	34	9	59	53	
31	2	35	246	3/-	58	9	32	58	9	26	10	1	34	10	1	53	
32	2	25	243	1/-	58	26	11	58	26	5	10	3	0	10	3	41	
33	2	0		3							10	6	46				
34	1	50	236		59	12	33	59	12	28	10	8	56	10	8	47	
35	1	0	226		60	16	59	60	16	55	10	15	51	10	16	0	
36	0	40	220		60	56	21	50	56	16	10	20	57	10	20	31	
37	0	30	217		61	16	11	61	16	6	10	22	54	10	22	50	
38	0	20	214		61	36	12	61	36	8	10	25	0	10	25	12	Cornu occidentale verticale cum centro Solis.
39	Finis.		209	1/2	62	6	23	62	6	19	10	28	41	10	28	50	

Post



BRITISH MUSEUM NATURAL HISTORY

Poſt Eclipſin.

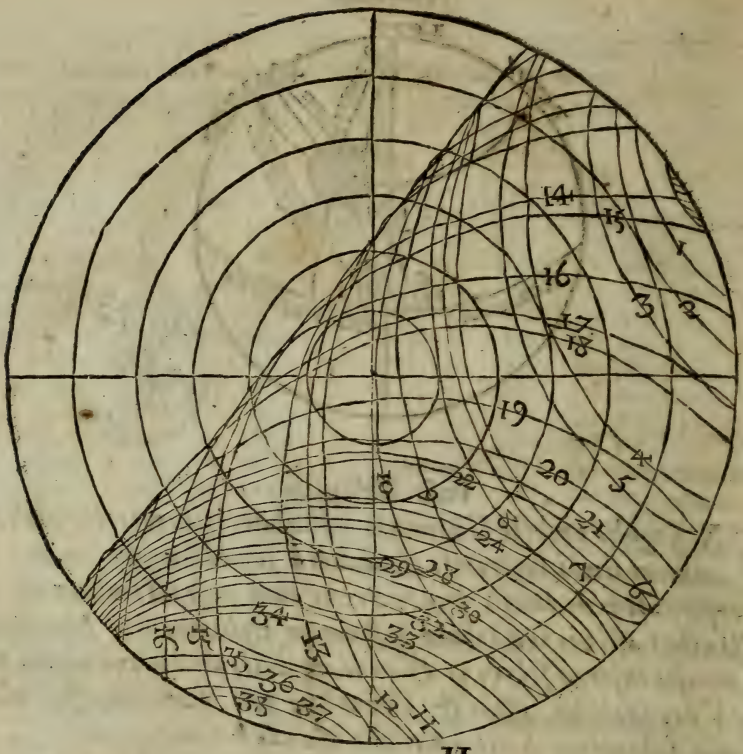
EX ſingulis umbris Gnomonis calculo trigonometrico altitudinem limbi ſuperioris & deductâ ſemidiametro, centri Solis apparentem deduxi; hanc correxi cum refractionibus & parallaxibus æſtivis tuæ tabulæ poſt novas Ephemerides Marchionis Malvaſiæ inſertæ fol 173. *& tandem datis altitudine centri Solis verâ declinatione, illius & elevatione poli Avenionenſis, eodem calculo diſtantiam Solis à meridie & inde horam cognovi.*

Proportio diametrorum apparuit æqualis in Eclipſi 6. *digitorum, tunc enim cornua Solis verticalia diſtabant à verticali Solis hinc inde gradibus circiter* 30. *Unde patet centrum Lunæ tunc reperiri in peripheriâ Solis & lineam diacentron eſſe æqualem ſemidiametro Solis. Verùm poſt medium Eclipſis mutationem aliquam in diametro umbræ deprehendimus; apparuit enim umbra paululum magis convexa & ideò ſemidiameter brevior, ſed ferè inſenſibiliter.*

Ex obſervatis figuram ſequentem aſtronomicam deſcripſi pro tribus phaſibus præcipuis, videlicet decimâ, quæ fuit digitorum 6. *& in qua cornua Solis fuerunt verticalia; pro* 14. *quæ fuit maximæ obſcurationis, & pro* 22. *quæ fuit digitorum* 4. *min.* 35. *& in qua cornua Solis fuerunt parallela horiſonti.*

Ope figuræ illius aſtronomicæ, parallaxes Lunæ & illius loca vera & viſa cognovi, ſuppoſito vero loco Solis & verâ latitudine Lunæ, collectis ex Rudolphinis.

Eadem pro omnibus phaſibus colligere potuiſſem equidem, ſed nimis laborioſa tot triangulorum reſolutio, & hæc ſufficere mihi viſa ſunt.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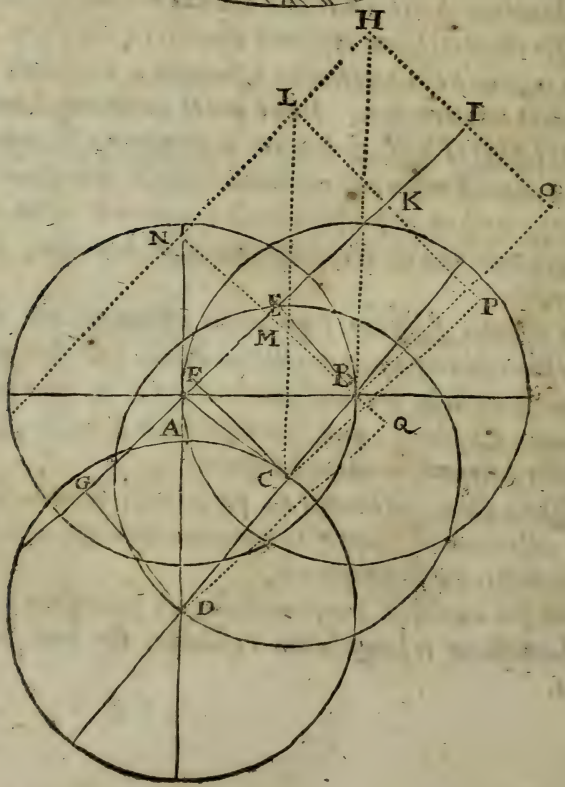
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	In Phasi 10. quæ est Digitorum 6.				In Phasi 14. quæ est maximæ obscurat				In Phasi 21. quæ est Digitorum 4. 35.			
	G.	M.	S.	T.	G.	M.	S.	T.	G.	M.	S.	T.
Verus locus Solis. *Gemini.*	21	3	15	0	21	4	0		21	5	32	
Declinatio illius.	23	11	50	0	23	11	53		23	12	0	
Ascensio recta.	80	15	32	0	80	16	22		80	18	0	
Tempus conversum in grad.	311	11	0		315	56	0		325	31	30	
Ascensio recta medii cœli.	31	26	32		36	12	22		45	49	30	
Gradus culminans. *Tauri.*	3	41	38		8	36	7		18	18	0	
Declinatio illius.	12	46	48		14	24	20		17	19	15	
Altitudo æquator. Aven.	46	7			46	7			46	7		
Altitudo grad. culmin.	58	53	48		60	31	20		63	26	15	
Distantia ejus à vertice.	31	6	12		29	28	40		26	33	44	
Distantia ejus à loco Solis.	47	21	37		42	27	53		32	47	32	
Altitudo Solis apparens.	45	10	57		48	30	37		55	0	8	
Distantia ejus à vertice.	44	49	3		41	29	23		34	59	52	
Angulus verticalis & eclipticæ.	43	33	40		44	41	36		48	30	10	
Ex datis tribus lateribus, per resolutionem triang. sphæric.												
Angulus orbitæ Lunæ cum verticali Solis.					38	58	41					
Ex datis basi, & uno latere in triangul. rectangulo.					A. C. D.							
Diacentron.	A.B.	15	1		A. C.	11	40	16	A. D.	18	33	30
Ex datis angulis & basi in triangul. rectangulo.					A. C. D.							
Latitudo visa Australis.	E.B.	10	52	54	F. C.	11	31	51	G. D.	13	54	0
Ex datis angulis & basi in triangulo rectangulo.	A. E. B.				A. F. C.				A. G. D.			
Distantia loci visi Lunæ à Sole.	A.E.	10	20	54	A. F.	1	9	44	A. G.	12	17	48
Ex datis angulis & basi in triangulo rectangulo.	A. E. B.				A. F. C.				A. G. D.			
Ergo locus Lunæ visus in Eclipt.	E.				F.				G.			
Gemini.	20	52	54	6	21	2	50	16	21	17	49	48
Latitudo vera Lunæ ex Rudolphinis, Bot.	I. H.	11	3	11	K. L.	11	1	19	M. N.	10	36	35
Parallaxis latitudinis.	H.O.	21	56	5	L. P.	22	18	10	N. Q.	24	30	35
Parallaxis altitudinis.	H. B.	31	49	36	L. C.	32	11	6	N. D.	32	43	24
Ex datis angulis & latere in triangulo rectangulo.	H. O. B.				L. P. C.				N. Q. D.			
Parallaxis longitudinis.	O. B.	23	3	48	P. C.	22	52	48	Q. D.	21	40	56
Ex datis angulis & basi in eodem triang. Ergo												
Verus locus Lunæ in Ecliptica.	H.				L.				N.			
Gemini.	20	29	50	18	20	39	57	28	20	56	8	52
Motus horarius verus Lunæ à Sole.		27	37	14	Motus horarius visus Lunæ à Sole.					26	10	15

Nam ut differentia temporis Phasium 10, & 22. ad differentiam locorum Lunæ in eisdem Phasibus, ita hora una ad motus horarios Lunæ à Sole.

Extract of a Letter from Mr. Butterfield *Mathematique Inſtrument-maker to the French King, about the making of Microſcopes with very ſmall and ſingle Glaſſes: and of ſome other Inſtruments.*

I Doubt not but you may be as buſie at *London* as we are here in making of Microſcopes of the manner lately brought out of *Holland* by Mr. *Huigens*, whereof I have of ſeveral faſhions ready made. I have tried ſeveral ways for the making of Glaſſes of the bigneſs of a great Pins head and leſs; as in the flame of a Tallow-candle, and of one of Wax. But the beſt way of all I have yet found, to make them clear and without ſpecks, is with the flame of Spirit of Wine well rectified, and burned in a Lamp. Inſtead of Cotton I make uſe of very ſmall ſilver wire doubled up and down like a skein of thred; which being wet with the Spirit of Wine, and made to burn in the Lamp, giveth through the veril of the Lamp a very ardent flame. Then take your beaten Glaſs, being firſt waſhed very clean, upon the point of a Silver needle filed very ſmall, and wet with ſpittle. Hold it thus in the flame till it be quite round, and no longer for fear of burning it, and if the ſide of the Glaſs next the needle be not melted, you may put it off and take it up with the needle on the round ſide, preſenting the rough ſide to the flame till it be every where very round and ſmooth, then wipe and rub one or ſeveral of them together with ſoft leather, which makes them much the better. Then put them between two pieces of thin braſs, the Apertures very round and without bur, and that towards the eye ſo big almoſt as the diameter of the Glaſs: and ſo placed in a Frame with the object conveniently for obſervation.

I publiſhed laſt year in the *Journal de Scavans* a trial of mine Invention with a Tube with Glaſſes and a Thred hanging between four points, with a weight in a Box ſo contrived, that as ſoon as the Inſtrument is ſet down, you have your point of Horzon with a great deal of exactneſs. It hath been ſo well approved of, that the River which the King maketh to come twenty Leagues off to *Paris*, is conducted by it.

At

At preſent I am finiſhing another. Inſtead of four points it playeth on one Steel point, ſtanding on a Diamond: the making of which I do intend to publiſh. I hope it will be of great uſe for its exactneſs and ſpeedineſs of working.

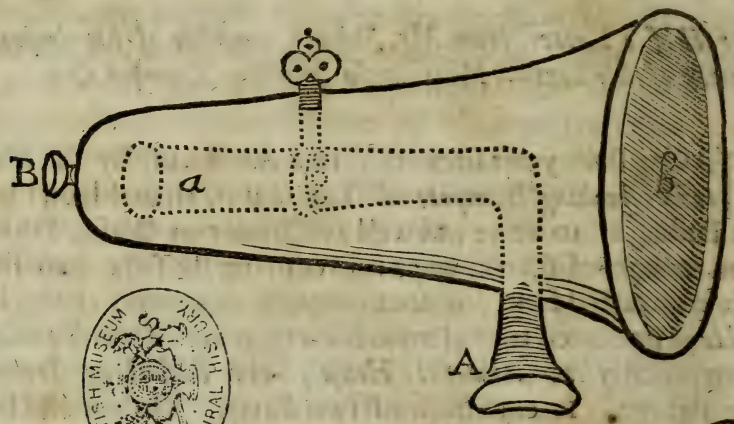
I am at preſent making a ſilver Planiſphere of two foot diameter for the King; the Invention of that famous Aſtronomer, and my very good friend, Mr. *Caſſini*. It ſheweth a very eaſie way to know and find out moſt of the fixed Stars, and the hour of the night very ſpeedily.

Extract of a Letter from Mr. John Conyers, *of his Improvement of Sir* Samuel Moreland's *ſpeaking Trumpet, &c.*

HAving ſome years ſince try'd to make one of Sir *S. Moreland's ſpeaking Trumpets* of Tin, that is, tinned Iron Plate; and finding it to ſerve, as well as Copper or Glaſs; I thereupon thought of ſeveral ways for reducing the ſame into ſome more contracted form, without abating its power: and by Dr. *Goddard* preſented to the Royal Society, at one of their Meetings (then uſually at *Arundel Houſe*) the *Reflecting Trumpet* here figured. It conſiſteth of two Parts. The utmoſt (B b) is a large *Concave Pyramid*, about a yard long, (or may be of any managable length) open at the *baſe* (b), and cloſed, not with a *flat*, but a *concave head*, at the *Cone* (B). Within this is faſtned a bended *Tube* (A a) as in the *Figure*. In the preſence of the *Royal Society* it was then alſo experimented, That this *Trumpet* did diſtinctly deliver certain words from the ſaid Houſe croſs the Garden, and the River *Thames*, and that againſt the *Wind* which was then ſtrong: and the words were written down by one that was ſent over for that purpoſe. Whereby it appeared, That a *Reflecting Trumpet* after this or ſome other like manner, of Wood, Tin, Pewter, Stone or Earth, or which may be beſt, of Bell mettle, will carry the voice as far, if not farther, than the *long* one invented by Sir *Samuel Moreland*. Beſides that it ſeems to take off from the aſtoniſhing noyſe near at hand, which happens in the uſe of the ſaid long Trumpet; ſo that it may be uſed within doors, with advantage, upon ſeveral occaſions.

Some

Some other trials were made to effect the above mentioned Contraction, which were found not to anſwer. Yet becauſe they may ſerve, in ſome part, to ſhew the motion of ſound, I have added two Examples hereof. The firſt is Sir *Samuel Moreland*'s Trumpet Angularly Arched in the middle; the ſecond, with three large Angular Arches reaching almoſt from one end to the other, as in the *figures*: by the former of which the delivery of ſound, to any diſtant or remote place is much ſhortened; but by the latter almoſt wholly obſtructed.



BRITISH MUSEUM NATURAL HISTORY

Fig.I.

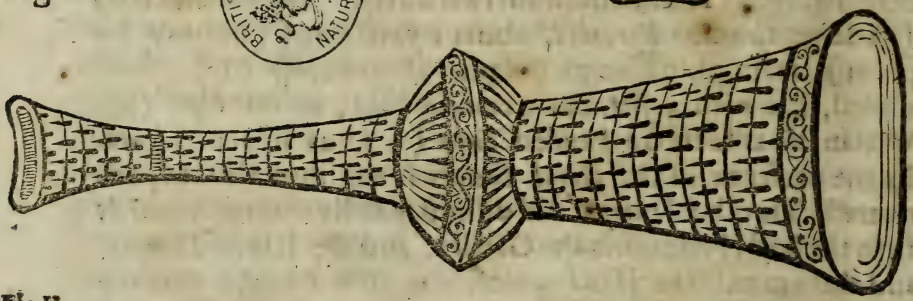
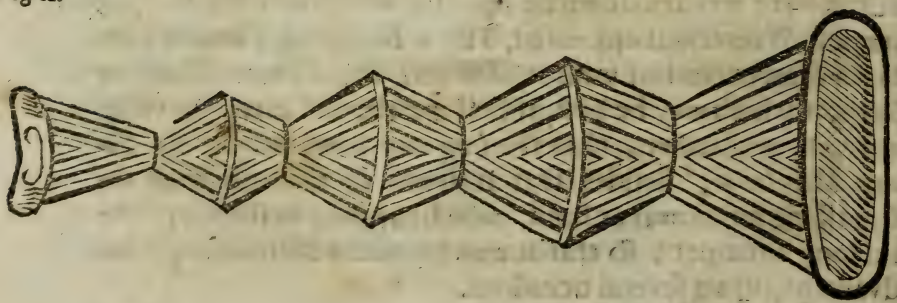
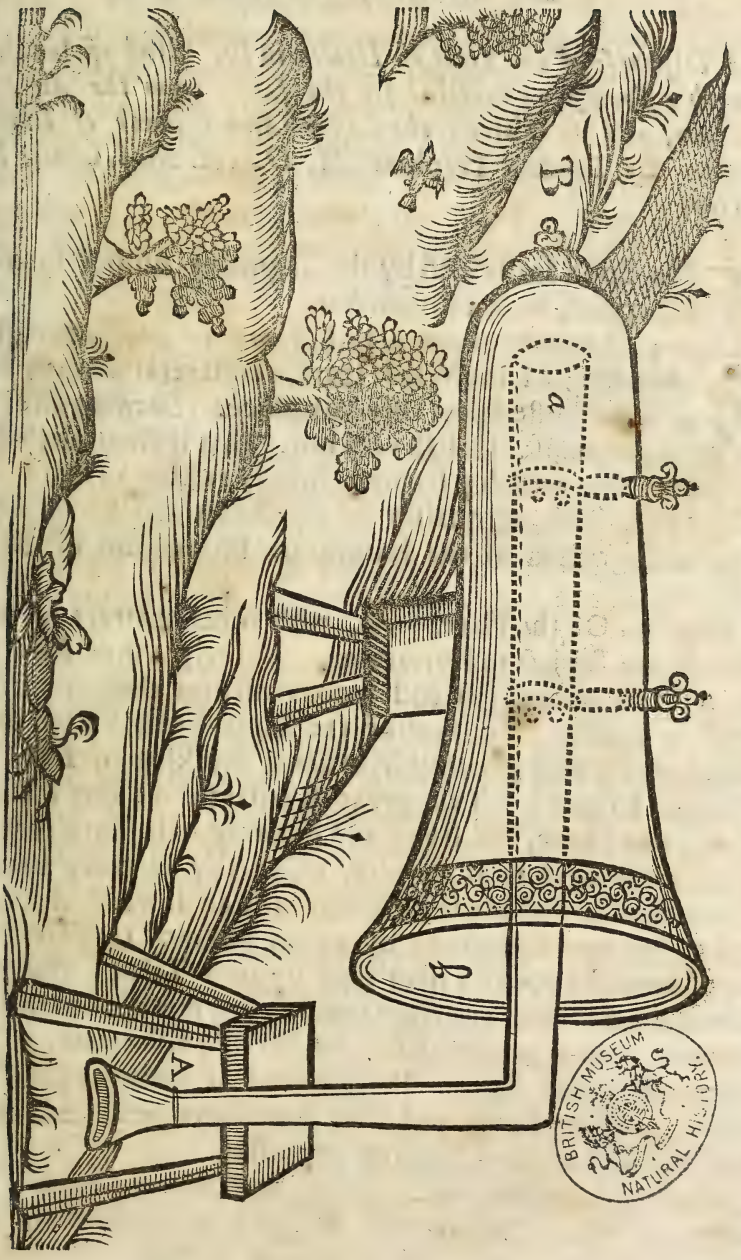


Fig.II.





BRITISH MUSEUM
NATURAL HISTORY

An Account of two Books:

I. *A Discourse of the State of Health in the Island of* Jamaica, *with a Provision calculated for the same, from the Air, the Place, and the Water; the Customs and manner of Living, &c. By* Thomas Trapham *M. D. Coll. Med.* Lond. *Soc. Hon.*

THis Book is divided by the Ingenious Author into ten Chapters, with a Conclusion.

Chap. 1. Treateth of the Air of *Jamaica*. As, amongst other particulars, of the Winds there, and several kinds of Breezes; with the Distempers they introduce. Shewing also, that 'tis thick and moist, though very hot. That it aboundeth with a Volatile Nitrous Salt; from the speedy rusting of Iron, and the great fructifying quality of the Rains and Dews there. With a Digression of the Nature or Production of Nitre, &c.

Chap. 2. Of the Place. As, with other matters of note, Whence not subject to Hurricanes. Description of *Port Royal*: with the advantages and inconveniences therein with respect to health. Account of the Sugar-works: and of the Distempers which proceed from much drinking of *Rum*, and other hot Liquors. Two great Rarities: the one a sort of Trees, not rotten, but living and growing, the Bark of which shines in the dark most vividly, especially in rainy weather. The other a sort of Seeds, endued with an inward throbbing Puls or Spring of Motion: by means whereof they will also leap sometimes above a span high upon a Table; and being placed at a distance, continue that leaping motion one towards another: which power of self-motion they also retain, in some degree, for many days. Descriptions of several Parts of the Island. Of the *Cacaa*, and other Plants here produced. A Natural History of the Countrey promised.

Chap. 3. Of the Water. As of the River *de Covre*. How cured by the Spaniards, *&c.* A better water near the Port. Danger of Well-water, especially at *Ligany*. Rivers and Springs abound. A Vegetable which being cut, affords a co-

pious

pious and healthful Liquor. Uſes of the *Coco* Nut-tree.

Chap. 4. Of the Cuſtoms and Manners of Living. Where a ſutable and regular Diet is recommended. Beſt Wine for the Jamaicans brought from *Madera*. How the Jamaican to order himſelf in the night. Whence it is, that in *Jamaica* four Males dye for one Female. Of *Chocolate* (the Manna of the *Weſt-Indies*) its preparation and uſe. Of Fruits, Fleſh, and Fiſh, which the beſt. Particularly, the Sea-Tortoyſe excellent food. With ſeveral obſervations of this Animal. Of the *Manaty* or Sea-Cow. The Jew-fiſh, *&c.* Here no venemous Creatures, *&c.*

Chap. 5. Of the Intemperatures and Diſeaſes of the Place in general, and Fluxes in particular. The Diſeaſes here, few, and ſimple. Small Pox, Plague, Conſumptions, Stone, but rare: As alſo the Diſeaſes incident to Women in Northern Countries: Childbirth eaſie to admiration. Symptomes and cure of the Simple Flux, Bloody Flux, and White Flux.

Chap. 6. Of the Fevers in *Jamaica*. As their Nature, Remedies. Uſually Intermittent. The uſe of *China* herein.

Chap. 7. Of the Dropſy, called the Countrey Diſeaſe. A ſpecifick Remedy hereof growing in *Jamaica*, called the *Dumb Cane*, becauſe, whoſoever toucheth it with his Tongue, becometh dumb for ſome hours. Applied by the Author only outwardly. How to be prepared and uſed: and its odd effects. Occaſionally of the Herb *Verbene* very ſucceſsfully applied in the Pleuriſie. The uſe of a Decoction of *Savanna Weed*, a ſort of *Spikenard*.

Chap. 8. Of Worms. Whence ſo frequent in *Jamaica*; eſpecially in Children, Women, and Infirm. Amongſt others, *Jamaica Aloes* one ſpecifick for them, *&c.*

Chap. 9. Of the *Lues Venerea*. Some conjectures of its Original. Deſcription of the *Yaws*, cured in *Jamaica* with eaſe and certainty by a methodical uſe of Vomits, Purging, and Bleeding: together with a Remedy for external ſores, of eaſe preparation; which is alſo deſcribed. A Conjecture, That many of the Symptomes in the Yaws and Pox, may proceed from little Animals, bred in and about the Spermatick Parts. The uſe of a Balſamick Juyce in the Pox, diſcovered by wild Boars.

Chap. 10. Of the Dry-belly-ach. How occasioned. Its terrible Symptomes. Often proves Chronical. Bathing a sure Remedy. A Specifick to be used with the forementioned Balsome.

The Conclusion. Wherein Baths are recommended for preventing most of the forementioned Diseases. The Author's Opinion of the Production of *Ambergriese*.

II. *Catalogus Stellarum Australium: sive Supplementum Catalogi Tychonici, exhibens Longitudines & Latitudines Stellarum fixarum, quæ prope Polum Antarcticum sitæ, in Horizonte Uraniburgico Tychoni inconspicuæ fuere, accurato Calculo, ex Distantiis supputatas, & ad Annum* 1677. *completum correctas. Cum ipsis Observationibus in Insula S. Helenæ (cujus Latitudo* 15 *gr.* 55 *m. Austr. & Longit.* 7 *gr.* 00 *m. ad Occasum à Londino) summâ Curâ & Sextante satis magno de Cælo depromptis. Opus ab Astronomicis hactenus desideratum. Accedit Appendicula de Rebus quibusdam Astronomicis, notatu non indignis. Authore* Edmundo Halleio, *è Coll. Reg.* Oxon.

THE diligent and most accurate Author introduceth these his Observations with a Preface; therein noting, That from his said Observations it is most clear, that all the Astronomical Tables hitherto extant, are defective in Calculating the Motions of Celestial Bodies: that *Saturn* moveth much more slowly, and *Jupiter* more swiftly, than by those Tables is reckoned upon. That hereupon, he began to go about to correct them; but presently foresaw, that could never be well done, without a more correct Catalogue of the fixed Stars: the performance whereof, is already undertaken by other excellent hands. That he therefore chose rather to take upon himself the stateing of the places of the fixed Stars near the Southern Pole, and out of our Horizon: which no one, that he knoweth, hath, with proper Instruments, before undertaken. What *Frederick Houtman*'s Instruments were, by whose Observations in *Sumatra*, *Blaeu* pretended to correct his Celestial Globe, our Author knows not; but saith, That by comparing that Globe with this his present Catalogue,

it

it appeareth he understood little of Astronomy. Which considering, and being also approved and encouraged by divers persons of much Worth and Honour, as my Lord *Brouncker*, Sir *Joseph Williamson*, Sir *Jonas Moore*, and others, & even by the King also, he thereupon furnished himself with such Instruments as were necessary for his purpose: which he particularly mentions and describes. Of these, he saith, he made the utmost and most assiduous use that could be, in a place of so thick and cloudy a Sky, as that of St. *Helena*, contrary to common report, prov'd to be; having restored about 350 fixed Stars, which were omitted in *Catalogo Tychonico*. The places whereof he presumeth he hath truly assigned, taking in, or not without respect to, the places of some of the Stars in the forementioned Catalogue; in which the Obliquity of the Ecliptick is supposed to be 23 gr. 31 m. 30 s. which (saith our Author) is most certainly too much. Yet because he designed not a correction of the whole Sphear; and because it appears not, as yet, within half a minute, how great that Obliquity is; and that this his own Catalogue may be easily reduced to any Obliquity, he thought not fit to meddle with that.

After the Preface, follow the Observations themselves: wherein to his own, the Author hath added an ancient Catalogue out of *Clavius*'s Commentaries *In Sphæram Jo. de Sacrobosco*; and that of *Bartschius è Tabulis Rudolphinis Keplerii*: that being compared with these his Observations, it might evidently appear how very much the Ancient Globes do almost every where differ from the Heavens. From these Observations, as he proceeds, he also proposeth some conjectures of the corruptibility, or at least the mutability of the fixed Stars.

Next there is a Table of the Right Ascensions of the Southern fixed Stars, and their Distances from the Pole: For the use of Navigators.

Hereto is subjoyned an Observation of *Mercury* by our Author, *scil.*

Mercurii Transitus sub Solis Disco. Oct. 28. *Anno* 1677. *Cum Tentamine pro Solis Parallaxi.*

Of his conjectures here made about the Suns Parallaxis, in his

his aforesaid Preface, he saith, That were the place of *Mercury*'s Node once found, from this his Observation of *Mercury*, the Suns Parallaxis might be deduced.

Hereto are added, by our Author,
Modi quidampenè Geometrici pro Parallaxi Lunæ investiganda.

Of which, there are three proposed, Yet the best way of finding the same (as the Author noteth in his Preface) would be, by comparing the Meridian Altitudes of the Moon, observed both in St. *Helena* and in *Europe* at the same time.

The concluding Chapter is entitled,
Quædam Lunaris Theoriæ Emendationem spectantia.

Wherein it is (as is noted in the said Preface) that Astronomy is at present most of all defective. And that the discovery hereof would lead us to the most exact way of finding out the Longitude of places.

LONDON,
Printed for *John Martyn*, Printer to the *Royal Society*. 1679.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *December*, *January*, and *February*, 1678.

The Contents.

Anatomical Observations of an Abscess in the Liver, &c. *Of four Ureters*, &c. *in an Infant. Observations Di.* Anthonii Leewenhoeck, de prognatis è Semine genitali Animalculis, &c. *The Art of Refining. An Account of the* Englisn Allum-*Works. Of the* Englisn *Green*-Copperas-*Works. Of the Salt Waters of* Droytwich *in* Worcestershire. *The Description, Culture and use of Maiz. An Account of the manner of making* Malt *in* Scotland. *An Account of a Book written lately by Sir* George Ent, *entitled* Ἀντιδιατριβὴ sive Animadversiones, &c.

Anatomical Observations of an Abscess in the Liver; a great number of Stones in the Gall-Bag and Bilious vessels; an unusual Conformation of the Emulgents *and* Pelvis; *a strange Conjunction of both Kidneys; and great dilatation of the* Vena Cava, *communicated by* Edw. Tyson *A. M. and M. S.* Oxon.

THe *Anatomie* of morbid Bodies, as Dr. *Harvey* hath observed, is most instructive; thereby we are acquainted not only with the many Causes that oppress Nature, but likewise with the Liberty she often takes in forming the parts different from her usual Rule; our present subject affords both. For on *September* 14th. 1678. opening the Body of a Reverend and worthy Clergy-man of this City (where were

preſent likewiſe Dr. *Paget*, Dr. *Morton*, Dr. *Wittie*, Dr. *Darel*, &c.) we obſerved the Liver to be very large and faſtned to the *Diaphragm* more then uſually; the *Colon* ſo firmly joyned to the Liver near the Gall-Bladder, that I could not ſeparate it without Inciſion. The Gibbous part of the Liver towards the right ſide, appeared diſcoloured, where making an Inciſion there plentifully iſſued out a perfect *Pus*, very fætid; as likewiſe there did from a wound I made in its Cavous part near the Fiſſure. This purulent Matter I found not contained in any particular *Cyſtis* or Bag, but in ſeveral *Sinus's* in that part of the Liver; whereas the other parts ſeemed ſound and well coloured. Nor did I meet with any where any Tubercules, Glandules, or Schirrhus.

This Abſceſs may well be preſumed the Cauſe of that lurking Feaver that took off the Patient; he labouring under it about ſix weeks, yet without much Complaints of ſickneſs, but troubled with irregular heats, yet ſometimes ſuch as were inperceptible to himſelf: twice or thrice, but at great diſtances, he had paroxyſms of Chill fits like an Intermittent Feavor, but ſuch a *fætor* and dryneſs in his Throat as proved obſtinate to all Medicines. His approaching Death was attended with other ſymptoms that uſually follow the affection of the Brain and *Genus Nervoſum*. Formerly he had been often ſubject to the Yellow Jaundice; and 'tis well worth the enquiry, why at preſent nothing thereof appeared? ſince the Gall Bladder was not only filled and crammed with Stones, but likewiſe the *Meatus Cyſticus* and *Ductus Communis* even to the *Duodenum*, were very much extended with them, as likewiſe in the *Porus Bilarius* I met with ſeveral ſmall ones. There was no fluid Gall contained in the Bladder, but ſome that was ſoft, of a deep yellow Ochre colour that filled up the Interſtices of the Stones. Theſe Stones were of a various bigneſs, from that of a large Nut, or Nutmeg, to a Pepper corn: their colour was of a darkiſh yellow Ochre, although in ſome there appeared *Laminæ* of a browner colour: to the touch, when a little dry, they ſeemed ſoapy; their weight was light, and their ſcent very fetid, reſembling that of the purulent matter in the Liver. Their conſiſtence was friable; their figure for the moſt part Triangular, or inclining to that figure, but all Angular; that ſide towards the Gall Bag was protuberant and con-

vex,

vex, the other two sides were flat; so that having the lesser Angle towards the Center of the Cavity of the Gall Bag, like so many wedges, they more compleatly filled it: I numbred I think above thirty.

Whether their Triangular figure be from the shooting of any Salts in the Gall, or from any other Causes, tis hard to determine. But I do suppose 'twill be found that they usually affect this figure; as in some others I have by me, taken out of the Gall-Bladder of a Woman at *Oxon* some years ago, do more plainly appear, which are also light, do feel soapy, consist of *Laminæ*, are of a whitish colour, not ill scented as the former, and of a triangular figure.

Our enquiry thus far had informed us of the Cause of the Patients Death, as well as of his former illness, and frequent disposition to the Jaundice. But prosecuting our search we were more surprised, to observe the unusual structure and conjunction of both Kidneys, the *Parenchyma* of the one being continued over the *Spine* unto the other, so that they both made but one continued semilunary Body. This although rare, yet hath been sometimes observed by former Authors. *Schenckius* mentioneth from *Casper. Wolphius* that *Rondeletius* formerly observed but one Kidney in an Humane Body, *qui formâ Lunari erat, ambo nimirum simul conjuncti. Caspar Bauhinus* in his *Theatr. Anatom.* hath given a figure of such a Kidney. But that which *Bartholin* describes in *Hist. Anatom. Cent.* 2. *Hist.* 77. comes much nearer our subject, although in several particulars different, as will appear by his Cut there, or as tis added by *Blasius* in his Appendix to *Bellinus, de structura & usu Renum.*

The Kidneys here were large, that part that conjoyneth them and lay over the *Spine*, was something lesser then the true Kidney's, and in its outward Tunicle or Membrane had three seams, although that *Parenchyma* inwardly seemed not to observe such a division, but was the same with the substance of the Kidney's. The Emulgent vessels were very numerous; for besides two larger veins that were subdivided into several lesser ramifications, there were divers other that were single, even to their insertion into the *Vena Cava*. The middle Part likewise by which both Kidneys were conjoyned was plentifully

tifully provided with Blood veſſels, for it received from the *Aorta* two Arteries, which before their inſertion, were each ſubdivided into three branches; and it ſent out two veins, which being joyned afterward into one, entered the *Vena Cava*. Beſides at the Seam at the lower part of the left Kidney, it had a Vein and Artery, which afterwards inſerted themſelves into the *Iliac* branches of the *Aorta* and *Cava*, ſo that Nature though erring from her wonted Rule in forming this part, yet was provident in furniſhing it with Veſſels. But to the whole *Compages* of the Kidney's, there belonged only two Ureters, but the great dilatation of the *Pelvis* in each was remarkable; for that of the left Kidney when blown up, was larger then it is repreſented in the figure, and had a triple origination; The right had but a ſingle one and was leſs.

Whether this Conformation and ſtructure of the Kidney's and its Veſſels were of much inconvenience to the Patient, I ſhall not define; but am apt to think, that it might occaſion as well the great dilatation of the *Vena Cava*, as alſo of the *Pelvis*: for the middle part conjoyning both the Kidneys lying over the *Vena Cava*, by its weight preſſing thereon, would hinder the free return of the Blood, which yet would make room for its ſelf, by enlarging its own Channel, which was ſo capacious as to contain three or four of my fingers. So likewiſe the *Ureters* running over that part that conjoyns the Kidneys like ſtrings over the Bridge of a Viol, in ſome Poſition of the Body they might have their paſſage ſo ſtreightned, that the Urin being impeded and regurgitating, might ſwell and ſtretch the Membrane of the *Pelvis* to this greatneſs.

The Explication of Fig. 1. *Tab.* 1.

A. The right } Kidney.
B. The left }
C. The middle part conjoyning both Kidneys.
d. e. f. Three ſeams in the Tunicle of the Kidneys.
G. The *Arteria Aorta*.
hh. Two Arteries from the *Aorta* which afterwards are ramified into three, and ſo inſerted into the ſaid middle part.

I. The *Vena Cava.*

KK. Two Veins arising from the middle part which uniting into one, entred the *Vena Cava.*

L. M. A Vein and Artery arising at the Seam (*f.*) which at last are both inserted into the *Iliac* branches of the *Aorta* and *Vena Cava.*

N.N. The Emulgent Artery of both Kidneys, whose ramifications are not here represented.

O.O. The Emulgent Veins; whereof some are single, others variously ramified.

P. P. Pelvis of both Kidneys, that of the left was extream large.

QQ. The two *Ureters.*

An Anatomical Observation of four Ureters *in an Infant, and some remarks on the* Glandulæ Renales, *made by the same ingenious Person.*

HAving in the former Observation given some remarks of the unusual Structure of the Kidneys, the Emulgent Veins and *Pelvis*; I shall here add what occurred to me *May* 23d. 1679. upon the opening the Body of an Infant, relating to those parts, particularly of the *Ureters*; which here I found double to both Kidneys, their Origination from the Kidneys being at some distance from each other; but afterwards both of the same side were incloſed in a *Capsula* or Membrane even to the Bladder, where those of the right side were inserted severally, yet near each other, but on the left they seemed to enter at the same Orifice. I have given a Cut of the right Kidney and of both the *Glandulæ Renales*, as well to shew their just magnitude and figure (as they appeared in this Body) as also their proportion to each other. As far as I have hitherto observed, the *Glandulæ Renales* in Embryo's and Infants are greater, at least proportionably, then *in Adultis.* They have a large Cavity, which by blowing into them I found emptied themselves into two Veins; whereof the right immediately passed into the *Vena Cava*, the left into the Emulgent: besides these they had other lesser ones from the neighbouring Vessels.

Explication

Explication of Fig. 2. Tab. 1.

A. The right Kidney, whose superfice seemed to be variously divided.
B. The Emulgent Vein.
C. The Emulgent Artery.
d. d. Two Ureters belonging to this Kidney.

Fig. 3. Represents the two Ureters of the left Kidney, which a little below the Kidney are both inclosed in a common *Capsula* or Case, and so continued to the Bladder.

Fig. 4. Represents the *Glandulæ Renales.*
A. The *Glandula Renalis* of the right side.
B.—— that of the left side.
C. The *Vena Cava.*
d. A vein or *ductus* opening from the cavity of this Gland and entering the *Vena Cava.*
e. A Vein from the left *Glandula Renalis*, and is inserted into a branch of the left Emulgent.

Observationes D. Anthonii Lewenhoeck, *de Natis è semine genitali Animalculis.*

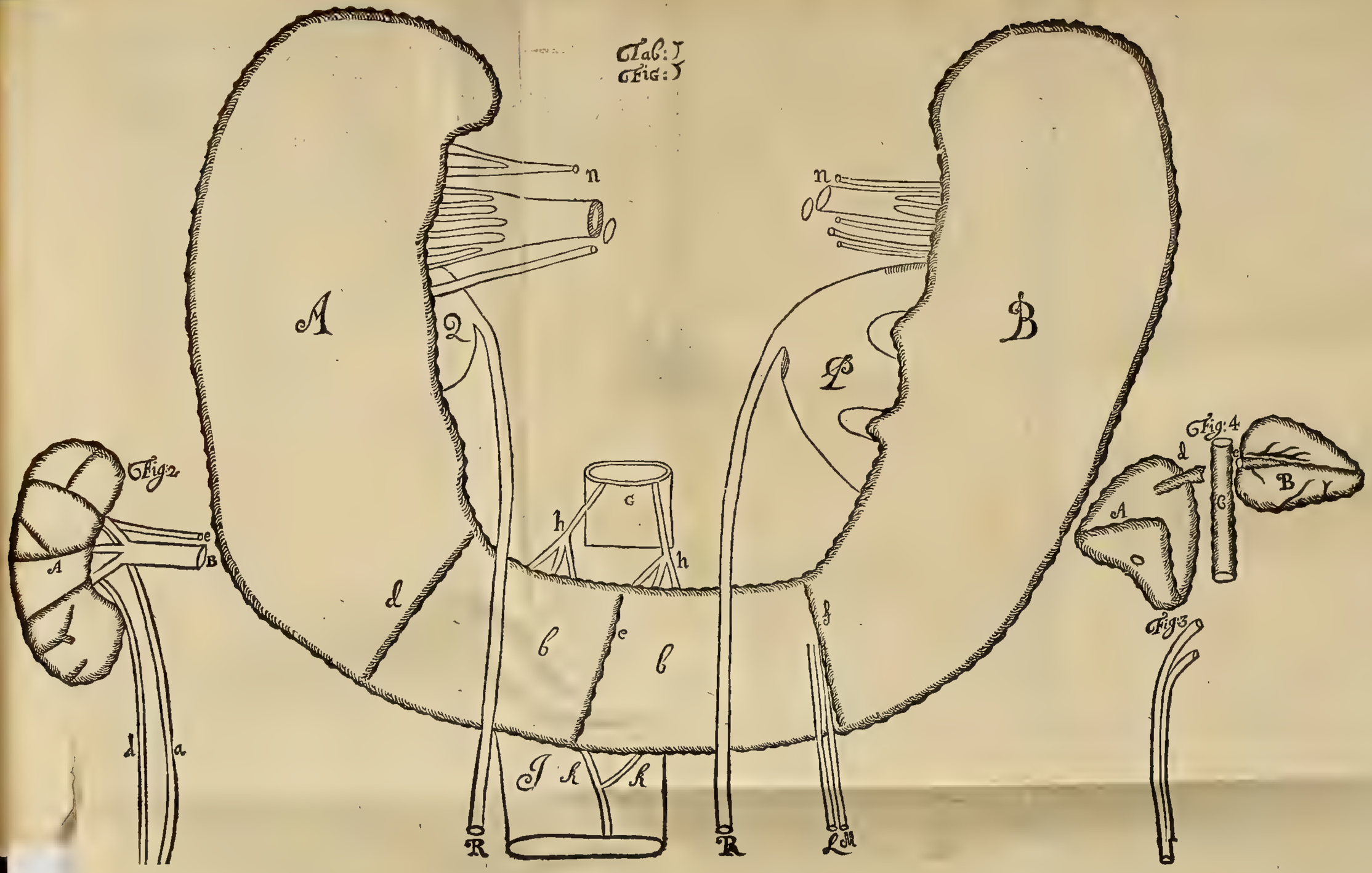
Nec non Auctoris harum Transactionum Responsa.

Observatoris Epistola Honoratiss. D. D. Vicecomiti *Brouncker*, Latinè conscripta; Dat. *Nov*, 1677. quam ipsissimis huc transmissis verbis inserendam Auctor censuit.

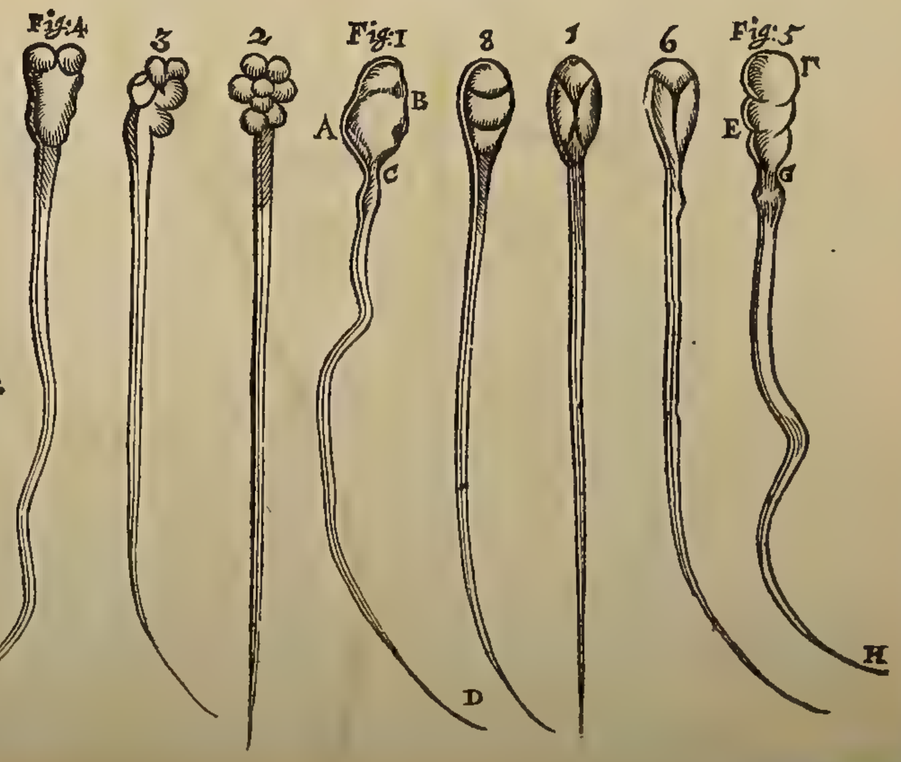
Nobilissimè Vir,

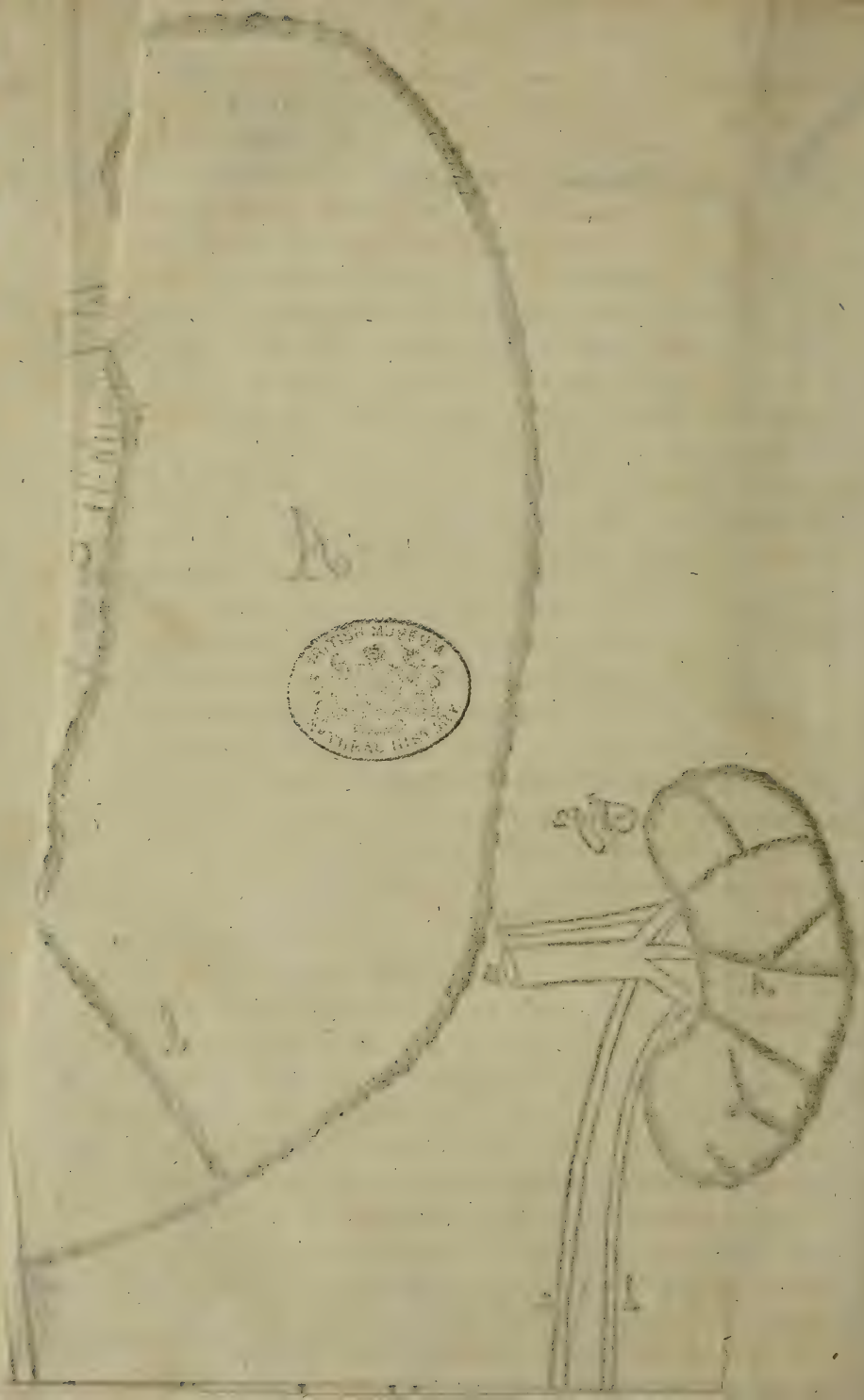
Ultimæ ad Vestram Nobilitatem datæ litteræ præteriti mensis decimo sexto, quamvis jam Nob. Vestræ utilissima negotia non interrumpere, animo proposueram, antequam certo scirem

Tab: 1
Fig: 1



Tab 2





scirem quis mihi in futurum adeundus : Tempus tamen otio terere in tantum nequivi, quin sequentia naturæ miracula Nob. vestræ transmittam, firmâ spe fretus παῤῥησίαν hanc, Nobilitatem Vestram in bonam partem accepturam.

Postquam Exc. Dominus Professor Cranen, *me visitatione sua sæpius honorarat, literis rogavit, Domino* Ham *cognato suo, quasdam observationum mearum videndas darem. Hic Dominus* Ham *me secundo invisens, secum in lagunculâ vitreâ semen viri, Gonorrhæâ laborantis, sponte destillatum, attulit, dicens, se post pauciſſimas temporis minutias (cum materia illa jam in tantum esset resoluta, ut fistulæ vitreæ immitti posset) animalcula viva in eo observasse, quæ caudata, & ultra 24 horas non viventia judicabat : Idem referebat se animalcula observasse mortua post sumtam ab ægroto Terebinthinam. Materiam prædictam fistulæ viteræ immissam præsente Domino* Ham, *observavi, quasdamque in ea creaturas viventes; at post decursum 2 aut 3 horarum, eandem solus materiam observans, mortuas vidi.*

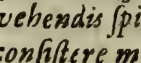
Eandem materiam (semen virile) non ægroti alicujus, non diuturna conservatione corruptam, vel post aliquot momenta fluidiorem factam, sed sani Viri statim post ejectionem, ne interlabentibus quidem sex arteriæ pulsibus, sæpiuscule observavi, tantamque in ea viventium animalculorum multitudinem vidi, ut interdum plura quam 1000. *in magnitudine arenæ sese moverent. Non in toto semine, sed in materia fluida crassiori adhærente, ingentem illam animalculorum multitudinem observavi ; in crassiori vero seminis materia, quasi sine motu jacebant; quod inde provenire mihi imaginabar, quod materia illa crassa ex tam variis cohæreat partibus ut animalcula in ea se movere nequirent. Minora globulis sanguini ruborem adferentibus hæc animacula erant : ut judicem millena millia arenam grandiorem magnitudine non æquatura. Corpora eorum rotunda, anteriora obtusa, posteriora ferme in aculeum desinentia habebant ; caudâ tenui longitudine corpus quinquies sexiesve excedente, & pellucidâ ; crassitiem vero ad 25. partem corporis habente prædita erant, adeo ut ea quoad figuram cum cyclaminis minoribus longam caudam habentibus optimè comparare queam: Motu caudæ serpentino, aut ut anguillæ in aqua natantis progrediebantur; in materia vero aliquantulum crassiori, caudam octies decieſve quidem evibrabant, antequam latitudinem capilli procedebant. Interdum mihi imaginabar, me internoscere posse ad huc varias in corpore horum animalculorum partes,*

quia

quia vero continuo eas videre nequibam, de iis tacebo. His animalculis minora adhuc animalcula, quibus non nisi globuli figuram attribuere possum, permista erant.

Memini me ante tres vel quatuor annos, rogatu Domini Oldenburg *B.M. semen virile observasse, & prædicta animalcula pro globulis habuisse; sed quia fastidiebam ab ulteriori inquisitione, & magis quidem a descriptione, tum temporis eam omisi. Et quæ adhuc observo ea sunt, quæ absque ulla mei peccaminosa coinquinatione, natura post coitum conjugalem relinquit: & si vestra Nobilitas judicet hæc vel nauseam, vel scandalum eruditis paritura, subnixè rogo Nobilitas Vestra sibi soli reservet, & ubi consultum ducit vel promat vel supprimat.*

Jam quod ad partes ipsas, ex quibus crassam seminis materiam, quoad majorem sui partem consistere sæpius cum admiratione observavi, ea sunt tam varia ac multa omnis generis magna ac parva vasa, ut nullus dubitem ea esse nervos, arterias & venas: imo in tanta multitudine hæc vasa vidi, ut credam me in unica seminis gutta plura observasse, quam Anatomico per integrum diem subjectum aliquod secanti, occurrunt. Quibus visis firmiter credebam nullo in corpore humano, jam formato, esse vasa quæ in semine virili, bene constituto, non reperiantur.

Semel mihi imaginabar me videre figuram quandam, ad magnitudinem arenæ, quam internæ cuidam corporis nostri parti comparare poteram. Cum materia hæc per momenta quædam aëri fuisset exposita, prædicta vasum multitudo in aquosam, magnis oleaginosis globulis permistam, materiam mutabatar: quales globulos inter medullæ spinalis vasa interjacere antehac dixi. Hisce oleaginosis globulis visis mihi imaginabar, quod forsan fuerint vasa convehendis spiritibus animalibus inservientia: eaque ex tam molli consistere materia, ut, intermittente humoris vel spirituum animalium transfluxu, illicò in globulos oleaginosos diversæ magnitudinis coalescant; præcipuè cum aëri exponuntur. Et cum prædicta materia paucillum temporis steterat, in ea observabantur trilaterales figuræ ab utraque parte in aculeum desinentes, quibusdam longitudo minutissimæ arenæ, aliquæ aliquantulum majores, A  *ut fig.* A. *Præterea, adeo nitidæ ac pellucidæ, ac si crystallinæ fuissent.*

Hæc sunt ter Nobilissime Vir, quæ Nobilitati Vestræ, reliquoque eruditorum agmini Philosophorum communicare propesueram:

Subnixè

Subnixè rogans Nobilitas Vestra velit acceptas has responso significare: interim post oblationem omnis generis servitiorum mansurus,

Nobilitati Vestræ addictissimus,
& subsignaverat
ANTHONIUS LEWENHOECK.

Auctoris ad Observatorem Responsum.

Cl. Vir,

VOluit *Honoratiss. Vice Comes* Brounckerus *Te certum faciam, Se tuas Literas* Nov. *datas, exiisque haud mediocrem delectationem, accepisse. Qualem ex earum lectione, me ipsum etiam, affecisse agnosco. Proponerem, Domine, si non displicuerit easdem Observationes in semine Brutorum, ut Canum, Equorum, aliorùmque, tentandas. Eâ ratione, ut non solùm quas feci ab omni post hac dubio melius vindices: verùm etiam, si qua Animalculorum, vel quoad numerum, vel etiam figuram esset differentia, tuæ sagaci investigationi innotesceret.*

Quod ad Vasa attinet, quæ Tibi saltem vidêris in parte seminis crassiori observasse; hærere me dubium non diffiteor. Quippe cùm non videam, quorsum Natura istiusmodi Vasa fabricasset. Omnino enim negat noster Harvejus (lib. de Generatione Animal.) se unquam in Utero statim à Coitu dissecto, semen maris invenisse. Et Doctiss de Graff. (lib. de partibus Fæmin. Gener. dicatis) audacter, & quantum ex propriis Observationibus intelligo, rectissimè asseruit, Quòd Testes Fæmineæ sint bina Ovaria; in quorum aliquo Ovo maximè maturo, & per Tubam Fallopianam in Uterum illapso, Fætus efformatur. Adeo ut Semen Maris nihil aliud sit, quàm Vehiculum Spiritûs cujusdam summè volatilis ac animalis, & conceptioni, i. e. Ovo Fæmineo contactum vitalem imprimentis.

Quare, & quæ Tibi videbatur Vasorum congeries, fortassis, Seminis sunt quædam filamenta, haud organicè constructa, sed dum permeârunt Vasa Generationi inservientia, in istiusmodi figuram Elongata. Non dissimili modo, ac sæpius notatus sum salivam crassiorem, ex Glandularum Faucium foraminibus editam, quasi è convolutis fibrillis constantem. Quæ de his ulterius experiri non gravatus fueris, avidè spero me ac capturum. Vale. Dat. Lond. *Cal.* Jan. 167⅞.

Observatoris præmissis Literis Responsi. Dat. Mart. 18. 7⅞.
& Teutonice conscripti, Capitula.

A Te rogatum est, ut Observationes meas è Semine etiam Brutorum desumptas & repetitas transmittam, &c.

Siquando Canes coeunt, Marem à Famina statim seponas, materia quædam tenuis & aquosa, (Lympham spermaticam intelligit) *è Pene solet paulatim exstillare. Hanc materiam numerosissimis Animalculis repletam aliquoties vidi; eorum magnitudine, quæ in Semine Virili conspiciuntur. Quibus particulæ globulares aliquot quinquagies majores permiscebantur.*

Quod ad Vasorum in crassiori Seminis Virilis portione spectabilium Observationem attinet, denuo non semel iteratam, saltem mihimet ipsi comprobasse videor. Meque omnino persuasum habeo, Cuniculi, Canis, Felis Arterias Venàsve fuisse à peritissimo Anatomico haud unquam magis perspicuè observatas, quam mihi Vasa in Semine Virili, ope perspicilli, in conspectum venêre.

Cùm mihi prædicta Vasa primùm innotuere, Statim etiam Pituitam, tum & Salivam Perspicillo applicavi. Verùm hic minimè existentia Animalia frustra quæsivi.

A Cuniculorum coitu, Lymphæ spermaticæ guttulam unam & alteram è Fœmella extillantem examini subjeci; ubi Animalia prædictorum similia, sed longè pauciora comparuere. Globuli item quam plurimi, plerique magnitudine Animalium, iisdem permisti sunt.

Horum Animalium aliquot etiam Delincationes transmisi. Figura 1. *exprimit eorum aliquod vivum,* (in Semine Cuniculorum arbitror) *eaque formâ quâ videbatur, dum aspicientem me versus tendit.* ABC. *Capitulum cum Trunco indicant.* CD *ejusdem Caudam. Quam, pariter ut suam Anguilla, inter natandum vibrat. Horum millena millia, quantum conjectare est, Arenulæ majoris molem vix superant. Fig.* 2, 3, 4. *sunt ejusdem generis Animalia, sed jam emortua.*

Fig. 5. *delineatur vivum Animalculum, quemadmodum, in Semine Canino, sese aliquoties mihi attentius intuenti exhibuit.* EFG. *Caput cum Truneo indigitant:* GH. *ejusdem Caudam. Fig.* 6, 7, 8. *alia sunt in Semine Canino, quæ motu & vitâ privantur. Qualium etiam vivorum numerum adèo ingentem vidi, ut judicarem, portionem Lymphæ spermaticæ Arenulæ mediocri respondentem, eorum, ut minimum, decena millia continere.*

Ex

Ex aliis *Observâtoris* Literis, Dat. *Maii* 31. 78. etiam Teutonicè conscriptis, aliquot huc spectantia excerpta.

SEminis Canini tantillum Microscopio applicatum iterum contemplatus sum; ineoque antea descripta Animalia numerosissima conspexi. Aqua pluvialis pari quantitate adjecta, iisdem confestim mortem accersit.

Ejusdem Seminis Canini portiunculâ in vitreo Tubulo unciæ partem duodecimalem crasso servatâ sex & triginta horarum spatio contenta Animalia vitâ destituta pleraque, reliqua moribunda videbantur.

Quo de Vasorum in Semine Genitali existentiâ magis constaret, delineationem eorum aliqualem mitto; ut in Fig. ABCDE. *Quibus literis circumscriptum spatium arenulam modiocrem vix superat.*

De Vasis, quoniam *Auctor* dubiis, ex Observationibus Anatomicis oriundis, quarum antea ex parte meminit, immoratur; ideo sequentia regerenda judicavit.

——— *Quæ videntur Vasa sive partes Organicæ & Tubulares, revera seminis cocti & coagulati filamenta viscosa è Vasis Testiculorum propriis ejaculata judicamus. Quorsum autem Vasa, si Fœminæ Ova hæc suppeditent? Et si Ova Gallinacea, quidni & Muliebria? Atqui muliebria, ubi, inquis, inventa sunt? In Ovariis. Quæ, quàm insulsè Testicula nuncupantur, vel exindepatet, quòd Vasa duntaxat sanguinea, nulla sibi propria obtineant. E contra, Ovaria quam appositè? utpote Ovorum, seu vesicularum, Lymphâ viscosa, instar Albuminis Ovi, distentarum, duplex congeries. Adèo autem pertinaciter sibi invicem adhærent, quòd immaturæ conspiciantur. Quin neque vel Avium Ova, prius quam matura, absque violenta divulsione ab Ovario solvuntur. Pariter ut videmus Glandes Nucesue Avellanas adhuc minusculas, caliculis suis firmâ continuitate infixas teneri: quæ tamen æstivo tempore, tactu excutiuntur mollissimo. Deinde, si Filicula ista viscosa, quæ pro Vasis ostendis, verè talia sint, ut supervacanea essent, ita etiam Generationi prorsus inepta. Adèo enim intransitu è Mari in Fœminam implicarentur (quod etiam ostendunt a Te exaratæ figuræ) ut Natura longè facilius opus moliretur*

extruendo nova Vasa quam hæc, si Vasa, in ordinem regularem & generationi idoneam restituendo. Observationes demum quas Transactionibus proximè editis & edendis (Num. 139 & 140) inserui, altera de Fœtu non matris in utero sed Abdomine invento, altera de Testiculo s. potius Ovario cujusdam mulieris Hydropico, rem omni dubio forsan extricabunt.

The Art of Refining, communicated by Dr. Christopher Merrit.

THe end hereof, is the separation of all other Bodies from *Gold* and *Silver*; which is performed four ways, *viz.* By *Parting*, by the *Test*, by the *Almond Furnace* or the *Sweep*, and by *Mercury*.

PARTING is done with *Aqua fortis*, which the Refiners make thus, ℞ *Salt Peter* ℔iii. *Dantzick Vitriol* ℔ii.

Let them be well bruised and mixed in a Morter and then put into a *Long-neck*, which is an Earthen Vessel so named from its Figure. Then six or eight of these *Long necks* thus filled, are placed in each side of their Furnace, on a *Range* built with Iron Barrs, of the form of a *parabola*, at above nine Inches distance one from another, and closed at the sides with Bricks. The upper Arches are left open to put in and take out the Pots. Over the said Arches they lay large Bars of Iron, and then cover all the top of the Furnace with Lome, the Body of each *Long-neck* lying naked to the Fire, the Neck outward; to which the Receivers, whether of Glass or German Pots, are well Luted.

Note that if the Vitriol be not *Dantzick*, which is made with Copper; but *English*, which is made with old Iron; the Water will be weaker, and make a dirty coloured Verditer, and wholly spoile it; besides, the Silver will not gather so well to the Copper after dissolution, and thereby becomes black.

Their Lute is made of good Lome, some Horse Dung, and a little *Colcothar*; although the two former do well. The luting being well labour'd and applyed, they make a gentle Charcoal fire under the Pots, for three hours, and then increase it for three hours more: about the seventh hour, they make a vehement hot Fire for four hours, and cast in at last well dried Billets of the length of the Furnace, whose flame sur-

ſurroundeth all the Pots, and finiſheth therir Work. The next morning they carefully ſeparate the Receivers from the Long-necks. Uſually performing this Work but once in 24. hours, ſometimes twice.

Some Refiners diſtill 100lb. of the materials put into a Caſt-Iron-Pot; which is the beſt way, eſpecially being perfomed after this lateſt Invention, *viz.*

Build a Furnace two yards high or more; and at the top place in your Iron-Pot. To which fit a Head of Earth, like the Head of a large Diſtillatory for Chymical Oyls, which muſt have a large belly, branching it ſelf, about eight inches from the Iron Pot, into three Branches: one whereof in the midſt, comes directly ſtreight forwards, two other lateral ones obliquely: all which Branches are four or five Inches hollow in diameter, and five or ſix long. To theſe Branches are fited Glaſs Bodies, narrow and hollow at both ends, large and globous in the midſt. Theſe muſt be exceedingly well luted on with *Colcothar*, Rags, Flower and Whites of Eggs. To this firſt Glaſs-Body is luted on another Glaſs, of the ſame figure and ſize, and in order eight alike in all, till they come to the Receiver, which is an ordinary Gallon Glaſs. All theſe Rowes of Glaſſes lye on boards ſhelving from the Head to the Receiver. The two upper Receivers or Glaſs-Bodies need exceeding good Luting, for the reſt ordinary Lute will ſerve.

The conveniency of this way is, that a little Fire, and that of *New Caſtle* Coals, will do the work, you ſave a Long-neck for each five pounds of materials, and you need never break or un'ute any of the Receivers, but the lowermoſt.

The *Aqua fortis* being diſtilled off, is put into a large Earthen Pot, and there is added of fine Silver, one or two peny weight (which is called *Fixes*) to every pound of *Aqua fortis*, which within four hours will purge it from all dirt and impurity, and make it fit for Parting, which is thus done.

If their Silver guilt be fine enough for Wire, they only melt it in a Wind-furnace, and caſt it melted into a large Tub of water, that they may have it in ſmall pieces. But if it be but *ſtandard*, they firſt fine it on the *Teſt*. Theſe ſmall pieces taken from the water, being well dryed, are put into a Glaſs taper-

faſhion,

fashion, a foot high, and seven inches at the bottom; and then the Glasses are charged with *Aqua fortis* about two thirds of it, and set in a Range of Iron covered two inches deep with Sand, and a gentle Charcoal fire made under it.

Small bubles will soon arise, and the water also run over. If so, they take off the Glasses, and hold them, till it doth *defervescere*, or else pour some of it into a Vessel which is at hand.

If Lead be mixed with it, they cannot keep it from running over.

When the Water hath once been quieted, from this Ebullition, it will rise no more.

The greenness of the Water, manifesteth the quantity of Copper contained in it.

If the water boil over, 'twill penetrate the Bricks and Wood.

They commonly let it stand a night on the Iron Range, with a gentle heat under it, and in the morning softly pour off the water impregnated with all the Silver; all the Gold lying, like black dirt, at the bottom, which being washed out is put into small Parting-Glasses, and set over the Sand with fair Conduit-water for an hour, and then the water poured off. This is repeated five or six times, to seperate the Salt from the Gold, which is now fit to be melted, and Cast into an Ingot.

To regain the Silver they have large round Washing-Bowls, lined within with melted Rosin and Pitch (for otherwise the Water would eat the Wood and penetrate the sides of the Bowl) covered with Copper Plates ten inches long, six wide, and half or more thick. Into which Bowles they pour good store of water (the more, the better the Verditer) and then the Silver-water: which working on the softer Metal of Copper, leaves all the Silver in most fine Sand at the bottom, and sides of the Bowl and Plates of Copper; which being taken out, is washed, dryed and melted for any use.

Concerning the Plates 'tis observable, That if any Brass or shroffe Metal be in them; they gather very little of the Silver, the latter mixing with the Silver, as 'twas proved at the *Tower* by a Finer questioned for his Silver.

With the Copper-Water poured off from the Silver, and Whiting, Verditer is made thus. They put into a Tub a hundred

hundred pound weight of Whiting, and thereon poure the Copper-Water, and ſtir them together every day, for ſome hours together. And when the Water grows pale, they take it out, and ſet it by for further uſe, and pour on more of the Green-Water, and ſo continue till the Verditer be made. Which being taken out, is laid on large pieces of Chalk in the Sun, till it be dry for the Market.

The Water mention to be taken from the Verditer, is put into a Copper, and boil'd till it comes to the thickneſs of Water gruel, now principally conſiſting of Salt Petre reduced (moſt of the Spirit of Vitriol being gone with the Copper into the Verditer.) A diſh full whereof being put into the other Materials, for *Aqua fortis*, is rediſtill'd, and makes a double-water, almoſt twice as good, as that without it, and ſold for neer a double value.

I COME next to the ſecond way of Refining, *ſc.* by the *TEST*. This ſeperates all Metals from Silver, except Gold, becauſe they ſwim over it, when they are all melted together.

The *Teſt* is thus made. They have an Iron Mould, oval, and two inches deep. At the bottom hereof, are three Arches of Iron ſet at equal diſtances, two fingers wide, if the great diameter of it be fourteen inches long; and ſo proportionably in greater or leſſer *Teſts*.

This cavity they fill with fine powder of Bone-aſhes, moiſtned with *Lixivium* made with Soap-aſhes. Some uſe Cakes of Pot aſhes or other Aſhes well cleanſed, and ſo preſſed well together with a Muller, that it becomes very cloſe and ſmooth at the top.

There is left above a Cavity in the midſt of it, to contain the melted Silver. This Cavity is made greateſt in the middle; for the Bone-Aſhes come up parallel to the circumference of the Mould; only a ſmall Channel in that end, which is moſt remote from the blaſt, for the running off of the baſer Metals, and ſo is made declive to the centre of the *Teſt*, where 'tis not above half an inch deep.

The *Teſt* thus made, is ſet annealing 24. hours, and then it is fit for uſe, in this manner. 'Tis ſet in a Chimney a yard high, parallel almoſt to the Noſe of a great pair of Bellows, and then therein is put the Silver. Which being covered all over with Billets of barqued Oak, the blaſt begins and continues all the

while

while ſtrongly. The Lead purified from all Silver, (which they call the Soap of Metals) firſt put in, melts down with the Silver, and then the Lead and Copper ſwim at the top, and run over the *Teſt*. Whoſe motion the Finer helps with a long Rod of Iron drawn along the ſurface of the Silver towards the fore-mentioned ſlit, and often ſtirring all the Metal, that the impurer may the better riſe: and by continuing this courſe, ſeperation is made in two or three hours.

The greateſt part of the Lead flies away in ſmoak.

If the Lead be gone before all the Copper, 'twill riſe in ſmall red firy bubbles; and then they ſay, the Metal *Drives*, and muſt add more Lead. The force of the blaſt drives the higher Metals to the lower ſide of the *Teſt*, and helps its runing over.

When the Silver is fully fined, it looks like moſt pure Quick-ſilver; and then they take off their ſogs and let it coole. In the cooling, the Silver will frequently from the middle ſpring up in ſmall Rayes and fall down again. If moiſt Silver be put into that which is melted, 'twill ſpring into the fire.

A good *Teſt* will ſerve two or three firings.

So ſoon as the Silver will hold together, they take it out of the *Teſt*, and beat it on an Anvile into a round figure, for the Melting Pot: which being ſet in a Wind-Furnace, ſurrounded with Coal, and covered with an Iron Cap, that no Charcoal fall into it, is then melted.

If any Droſs or filth be in the Melting-Pot, they throw in ſome Tincal, which gathers the droſs together that it may be ſeparated from it.

Theſe Melting-Pots are never burned, but only dryed, and will laſt a whole day, if they be not ſuffered to cool: but if they once cool, they infallibly crack.

NEXT IS the *ALMOND-FURNACE* or Sweep. Here are ſeparated all ſorts of Metals from Cinders, parts of Melting-Pots, Teſts, Brick, and all other harder bodies; which muſt be firſt beaten into ſmall pieces with a hammer, and an Iron Plate; and 'tis one mans work.

Thoſe which ſtick but ſuperficially to their Silver, they waſh off thus; they have a Wooden round Inſtrument two foot wide, ſomewhat hollow in the middle, with a handle on each ſide. On this they put the Materials, and hold them in a Tub

of

of Water below the ſurface, and ſo waving it to and fro, all the lighter and looſer matter is ſeparated from the Metal.

The Furnace is ſix feet high, four feet wide, and two feet thick. Made of Brick; having a hole in the midſt of the top eight inches over, growing narrower towards the bottom of it, where, on the fore part, it ends in a ſmall hole, environed with a ſemicircle of Iron to keep the molten Metal. About the middle of the Back, there is another hole to receive the Noſe of a great pair of Bellows, requiring continually the ſtrength of two luſty men.

The night before they begin, Charcoal is kindled in the Furnace to Anneal it: and when it is hot, they throw two or three ſhovels of Coal, to one of the forementioned Stuff, and ſo proceed during the whole Work, making *ſtratum ſuper ſtratum* of one and the other. After eight or ten hours the Metal begins to run; and when the Receiver below is pretty full, they lade it out with an Iron Ladle, and caſt it into Sows in Cavities or Forms made with Aſhes.

They frequently ſtop the paſſage-hole with Cinders to keep in the heat; and when they think a quantity of Metal is melted, they unſtop the hole to paſs it off.

If the Stuff be hard to *flux*, they throw in ſome *ſlag* (which is the Recrement of Iron) to give it fuſion. Their Irons melt away apace, wherewith they proak out the Cinders from the hole.

A ſtinking blue ſmoak proceeds from the Furnace, and all by-ſtanders put on the colour of dead men. The workmen muſt be well lined with Oyl, Sack, Strong Beer, and good Victuals: for the Work continues three days and nights without intermiſſion, uſing no other variety, than above ſaid.

A large Cavity will be made in the Furnace: for the Metals or the Fire, or both together corrode and wear the greateſt part of the bricks away.

To get the Silver from theſe Metals, they now uſe no other Art, than that of the *Teſt*.

To Refine their Copper from the Litharge, they formerly laid their Ingots of Lead and Copper on Loggs of Wood fired, which would eaſily melt down the Lead or Tinn, and ſo leave the Copper full of holes wherein the Lead had been lodged. But now they commit this work alſo to the *Teſt*.

THE LAST way of *Separation* is by *Quick-ſilver*. And this is for filings of ſmall Workers and Goldſmiths, wherein Gold and Silver are mixed with duſt, *&c.* This duſt is put into a Hand-mill with Quick-ſilver, and being continually turned upon that, and the Metals, an Amalgama is made of them, and fair water poured in, carrys off the duſt as it runs out again by a ſmall Quill.

This Amalgama is put into an Iron with a Bolt Head, ſet into the fire, having a long Iron-neck three feet long, to which is fitted a Receiver. The fire diſtils off the *Mercury* into the Receiver, and the Gold and Silver remain in the Bolt Head.

An Account of the Engliſh *Alum-Works*, *communicated by* Daniel Colwall *Eſquire.*

Alum is made of a Stone digged out of a Mine, of a Sea-weed, and Urine.

The Mine of Stone is found in moſt of the Hills between *Scarborough* and the River of *Tees* in the County of *York*. As alſo near *Preſton* in *Lancaſhire*. It is of a blewiſh colour, and will clear like Corniſh-ſlate.

That Mine which lies deep in the Earth, and is indifferently well moiſtned with Springs, is the beſt. The dry Mine is not good. And too much moiſture, cankers and corrupts the Stone; making it Nitrous.

In this Mine are found ſeveral Veines of Stone called Doggers; of the ſame colour, but not ſo good.

Here are alſo found thoſe which are commonly called Snake-ſtones. The people have a Tradition, that the Country thereabouts being very much annoyed with Snakes, by the Prayers of St. *Hilda* there inhabiting, they were all turned into Stones, and that no Snake hath ever ſince been ſeen in thoſe parts.

For the more convenient working of the Mine, which ſome times lies twenty yards under a ſurface or Cap of Earth, (which muſt be taken off and barrowed away) they begin their work on the declining of a Hill, where they may alſo be well furniſhed with Water. They digg down the Mine by ſtages, to ſave Carriage; and ſo throw it down near the places where they Calcine it.

The

The Mine, before it is Calcin'd being expoſed to the Air, will moulder in pieces, and yield a Liquor whereof *Copperas* may be made: but being Calcin'd, is fit for *Alum*. As long as it continues in the Earth, or in Water, it remains a hard Stone.

Sometimes a Liquor will iſſue out of the ſide of the Mine, which by the heat of the Sun is turned into Natural *Alum*.

The Mine is calcined with Cinders of *New-Caſtle* Coal, Wood and Furzes. The Fire made about two feet and a half thick, two yards broad, and ten yards long. Betwixt every Fire, are ſtops made with wet Rubbiſh; ſo that any one or more of them may be kindled, without prejudice to the reſt.

After there are 8. or 10. yards thickneſs of broken Mine laid on this Fewel, and five or ſix of them ſo covered: Then they begin to kindle the Fires: and as the Fires riſe towards the top, they ſtill lay on freſh Mine. So that, to what height you can raiſe the Heap, which is oftentimes about twenty yards, the Fires, without any further help of Fewell, will burn to the top, ſtronger than at the firſt kindling, ſo long as any Sulphur remains in the Stones.

In Calcining theſe Stones, the Wind many times doth hurt, by forcing the Fire in ſome places too quickly through the Mine, leaving it black and half burnt; and in others burning the Mine too much, leaving it Red. But where the Fire paſſeth ſoftly and of its own accord, it leaves the Mine white, which yields the beſt and greateſt quantity of Liquour.

The Mine thus Calcin'd is put into Pits of Water, ſupported with Frames of Wood, and rammed on all ſides with Clay; about ten yards long, five yards broad, and five feet deep; ſet with a Current that turneth the Liquor into a Receptory, from whence it is pumped into another Pit of Mine. So that every Pit of Liquor, before it comes to boyling, is pumped into four ſeveral Pits of Mine; and every Pit of Mine is ſteeped in four ſeveral Liquours, before it be thrown away; the laſt Pit being always freſh Mine.

This Mine thus ſteeped in each of the ſeveral Liquors twenty four hours or there about, is of courſe, four days in paſſing the four ſeveral Pits, from whence the Liquors paſs to the Boyling-Houſe.

The Water, or Virgin-Liquor oft times gains, in the firſt

Pit, two pound weight. In the ſecond encreaſeth to five pound weight. In the third, to eight pound weight. And in the laſt Pit, which is always freſh Mine, to twelve pound weight; and ſo in this proportion, according to the goodneſs of the Mine, and the well Calcining thereof. For ſometimes the Liquors paſſing the four ſeveral Pits, will not be above ſix or ſeven pound weight. At other times, above twelve pound weight, ſeldome holding a conſtant weight, one week together. Yet many times Liquor of ſeven or eight pound weight produceth more, *Alum*, than that of ten or twelve pound weight either through the illneſs of the Mine, or, as uſually, the bad Calcining thereof. And if by paſſing the weak Liquor through another Pit of freſh Mine, you bring it to ten or twelve pound weight, yet you ſhall make leſs *Alum* with it, than when it was but eight pound weight. For what it gains from the laſt Pit of Mine, will be moſt of it Nitre, and *Slam*, which poyſons the good Liquors, and diſorder the whole Houſe, until the *Slam* be wrought out.

That which they call *Slam*, is firſt perceived by the redneſs of the Liquor when it comes from the Pit, occaſioned either by the illneſs of the Mine, or as commonly the over or under Calcining of it, as aboveſaid; which in the Setler ſinks to the bottom, and there becomes of a muddy ſubſtance, and of a dark colour. That Liquor, which comes whiteſt from the Pits, is the beſt.

When a Work is firſt begun, they make *Alum* of the Liquor only that comes from the Pits of Mine, without any other Ingredients. And ſo might continue, but that it would ſpend ſo much Liquor, as not to quit coſt.

Kelp is made of a Sea-weed, called Tangle, ſuch as comes to *London* on Oyſters. It grows on Rocks by the Sea ſide, between High-water and Low-water mark. Being dryed, it will burn and run like Pitch; when cold and hard, 'tis beaten to aſhes, ſteeped in Water, and the Lees drawn off to two pound weight, or thereabout.

Becauſe the Country people, who furniſh the Work with Urine, do ſometimes mingle it with Sea-Water, which cannot be diſcovered by weight: they try it, by putting it to ſome of the boyling Liquor. For ſo, if the Urine be good, it will work, like Yeſt put to Beer or Ale, but if mingled it will ſtir no more than ſo much Water.

It

It is obſerved, that the beſt Urine is that which comes from poor labouring People, who drink little ſtrong Drink.

The Boyling Pans are made of Lead, nine feet long, five feet broad, and two and a half deep: ſet upon Iron Plates about two inches thick, which Pans are commonly new caſt, and the Plates repaired five times in two years.

When the Work is begun, and *Alum* once made, then they ſave the Liquour which comes from the *Alum*, or wherein the *Alum* ſhoots, which they call Mothers. With this they fill two third parts of the Boylers, and put in one third part of freſh Liquor vvhich comes from the Pits. Being thus filled up vvith cold Liquor, the Fires having never been dravvn out, vvill boil again in leſs than tvvo hours time. And in every two hours time, the Liquor will waſte four Inches, and the Boylers are filled up again with green Liquor.

The Liquor if good, will in Boyling, be greaſy, as it were, at the top: if Nitrous, it will be thick, muddy, and red. In boyling twenty four hours, it will be thirty ſix pound weight. Then is put into the Boyler about a Hogs-head of the Lees of Kelp, of about two peny weight, which will reduce the whole Boyler to about twenty ſeven pound weight.

If the Liquor is good, as ſoon as the Lees of Kelp are put into the Boyler, they will work like Yeſt put to Beer. But if the Liquor in the Boyler be Nitrous, the Kelp-Lees will ſtir it but very little; and in that caſe, the Workmen muſt put in the more and ſtronger Lees.

Preſently after the Kelp Lees are put into the Boyler all the Liquor together is drawn into a Setler, as big as the Boyler, made of Lead, in which it ſtands about two hours; in which time, moſt of the Nitre and Slam ſink to the bottom.

This ſeparation is made by means of the Kelp-Lees. For when the whole Boyler conſiſts of Green-Liquor drawn from the Pits it is of power ſtrong enough to caſt off the Slam and Nitre: but when Mothers are uſed, the Kelp-Lees are needfull to make the ſaid ſeparation.

Then the ſaid Liquor is ſcooped out of the Setler, into a Cooler, made of Deal-boards, and rammed with Clay. Into this is put 20. Gallons or more of Urine, more or leſs, according to the goodneſs or badneſs of the Liquor. For if the Liquor be red, and conſequently Nitrous, the more Urine is required.

In

In the Cooler, the Liquor in temperate weather, ſtands four days. The ſecond day the *Alum* begins to ſtrike, gather and harden about the ſides, and at the bottom of the Cooler.

If the Liquor ſhould ſtand in the Cooler above four days, it would as they ſay turn to *Copperas*.

The uſe of Urine, is as well to caſt off the Slam, as to keep the Kelp-Lees from hardning the *Alum* too much.

In hot weather, the Liquors will be one day longer in cooling, and the *Alum* in gathering, than when the weather is temperate. In froſty weather the cold ſtrikes the *Alum* too ſoon, not giving time for the Nitre and Slam to ſink to the bottom, whereby they are mingled with the *Alum*. This produceth double the quantity: But being foul, is conſumed in the waſhing.

When the Liquor hath ſtood four days in the Cooler: Then that called Mothers is ſcooped into a Ciſtern, the *Alum* remaining on the ſides and at the bottom; and from thence the Mothers are pumped back into the Boyler again. So that every five days, the Liquor is boyled again, untill it evaporate or turn into Alum or Slam.

The *Alum* taken from the ſides and bottom of the Cooler, is put into a Ciſtern, and waſhed with Water that hath been uſed for the ſame purpoſe, being about twelve pound weight. After which it is Roached, as followeth.

Being waſhed, it is put into another Pan with a quantity of Water, where it melts and boils a little. Then is it ſcooped into a great Cask, where it commonly ſtands ten days, and is then fit to take down for the Market.

The Liquors are weighed by the Troy-weight. So that half a pint of Liquor muſt weigh more than ſo much Water, by ſo many penny weight.

An Account of the way of making Engliſh *Green*-Copperas, *Communicated by the ſame.*

Copperas-ſtones, which ſome call Gold-ſtones, are found on the Sea-ſhore in *Eſſex*, *Hampſhire*, and ſo Weſtward. There are great quantities on the Cliffs; but not ſo good, as thoſe on the Shore, where the Tides Ebb and Flow over them.

The

The beſt of them are of a bright ſhining Silver Colour: The next, ſuch as are of a ruſty deep yellow. The worſt, ſuch as have Gravel and Dirt in them, of a ſaddor Umber Colour.

In the midſt of theſe Stones, are ſometimes found the Shells of Cockles, and other ſmall ſhell Fiſhes; ſmall pieces of the Planks of Ships, and pieces of Seacoal.

The brighteſt of theſe Stones they uſe for Wheel-lock Piſtols and Fuſies.

In Order to the making of *Copperas*, they make Beds according as the Ground will permit. Thoſe at *Debtford*, are about an hundred feet long, fifteen feet broad at the top, and twelve feet deep, ſhelving all the way to the bottom.

They ram the Bed very well, firſt with ſtrong Clay, and then with the Rubbiſh of Chalk, whereby the Liquor, which drains out of the Diſſolution of the Stones, is conveighed into a Wooden ſhallow Trough, laid in the middle of the Bed, and covered with a Board; being alſo boarded on all ſides, and laid lower at one end than the other, whereby the Liquor is conveyed into a Ciſtern under the Boyling Houſe.

When the Beds are indifferently well dryed, they lay on the Stones about two feet thick.

Theſe Stones will be five or ſix years, before they yield any conſiderable quantity of Liquor; and before that, the Liquor they yield is but weak.

They ripen by the Sun and Rain. Yet experience proves, that watering the Stones, although with Water prepared by lying in the Sun, and poured through very ſmall holes of a Watering-pot, doth retard the work.

In time theſe Stones turn into a kind of Vitriolick Earth, which will ſwell and ferment like leavened Dough.

When the Bed is come to perfection, then once in four years, they refreſh it, by laying new Stones on the top.

When they make a new Bed, they take a good quantity of the old fermented Earth, and mingle with new Stones, whereby the Work is haſtned. Thus the old Earth never becomes uſeleſs.

The Ciſtern before mentioned is made of ſtrong Oaken boards, well joyned and chalked. That at *Debtford* will contain ſeven hundred Tuns of Liquor. Great care is to be taken,

taken, that the Liquor doth not drain through the Beds, or out of the Ciſtern. The beſt way to prevent the ſame, is to divide the Ciſtern in the middle by Oaken boards, chalked as before; whereby one of them may be mended in caſe of a defect.

The more Rain falls, the more, but the weaker, will be the Liquor. The goodneſs whereof is tryed by weights prepared for that purpoſe. Fourteen peny weight, is Rich. Or an Egg being put into the Liquor, the higher it ſwims above the Liquor, the ſtronger it is. Sometimes the Egg will ſwim near half above the Liquor.

Within one minute after an Egg is put in, the ambient Liquor will boil and froth; and in three minutes the ſhell will be quite worne off.

A drop of this Liquor falling on the Manufactures of Hemp, Flax, or Cotten-Wooll, will preſently burn a hole through it. As alſo in Woollen and Leather.

Out of the aforeſaid Ciſtern, the Liquor is pumped into a Boyler of Lead, about eight feet ſquare, containing about twelve Tuns, which is thus ordered. Firſt they lay long pieces of Caſt Iron, twelve inches ſquare, as long as the breadth of the Boyler, about twelve inches one from another, and twenty four inches above the ſurface of the fire. Then croſswiſe they lay ordinary flat Iron Barrs, as cloſe as they can lye, the ſides being made up with Brick-work. In the middle of the bottom of this Boyler is laid a Trough of Lead, wherein they put at firſt a hundred pound weight of old Iron.

The fewel for boyling, is *New-Caſtle* Coals. By degrees, in the boyling, they put in more Iron, amounting in all to fifteen hundred pound weight in a boyling. As the Liquor waſtes in boyling, they pump in freſh Liquor into the Boyler. Whereby, and by a defect in ordering the fire, they were wont to be above twenty days before it was enough. When that is, they try, by taking up a ſmall quantity of Liquor, into a ſhallow Earthen Pan, and obſerving how ſoon it will gather and cruſt about the ſides thereof.

But now of late by the ingenious contrivance of Sir *Nicolas Criſp*, the Work is much facilitated. For at his Work at *Debtford*, they boyl off three Boylers of ordinary Liquor in one Week. Which is done, firſt by ordering the Furnace

ſo,

ſo, as that the heat is conveyed to all parts of the bottom and ſides of the Furnace. Then whereas they were wont to pump cold Liquor into the Boyler to ſupply the waſte in boyling, whereby the Boyler was checked ſome times ten hours: Sir *Nicolas* hath now a Veſſel of Lead, which he calls a Heater, placed at the end of the Boyler, and a little higher, ſupported by Barrs of Iron as before, and fill'd with Liquor, which by a conveyance of heat from the Furnance, is kept near boyling hot: and ſo continually ſupplys the waſte of the Boyler, without hindring the boyling. Thirdly, by putting in due proportions of Iron from time to time, into the Boyler. As ſoon as they perceive the Liquor to boyl ſlowly, they put in more Iron, which will ſoon quicken it.

Beſides, if they do not continually ſupply the boyling Liquor with Iron, the *Copperas* will gather to the bottom of the Boyler and Melt. And ſo it will do, if the Liquor be not preſently drawn off from the Boyler into a Cooler, ſo ſoon as it is enough.

The Cooler is oblong, twenty feet long, nine feet over at the top, five feet deep, taper'd towards the bottom, made of Tarras. Into this they let the Liquor run, ſo ſoon as it is boyled enough. The *Copperas* herein will be gathering or ſhooting fourteen or fifteen days: and gathers as much on the ſides as in the bottom; *ſc.* above five inches thick. Some put Buſhes into the Cooler, about which the *Copperas* will gather. But at *Deptford* they make not uſe of any.

That which ſticks to the ſides, and to the Buſhes, is of a bright green, that in the bottom, of a foul and dirty colour.

In the end of fourteen days, they convey the Liquor into an other Cooler, and reſerve it to be boyl'd again with new Liquor.

The *Copperas* they ſhovel on a Floor adjoyning, ſo that the Liquor may drain from it into a Cooler.

The ſteam which comes from the boyling is of an acrimonious ſmell.

Copperas may be boyled without Iron, but with difficulty. Without it, the Boyler will be in danger of melting.

Sometimes in ſtirring the Earth on the Beds, they find pieces of *Copperas* produced by lying in the Sun.

An Account of the Salt Waters of Droytwich *in* Worceſterſhire; *ſent by Dr.* William Cole *from Dr.* Tho. Raſtell, *who hath lived many years upon the place, and hath there ſeveral Phats of his own*

SIR,

HAving heretofore ſeen in ſome of the Tranſactions of the Royal Society, Queries concerning the Salt-Springs in *Cheſhire*, and not hearing of any account hath been given them of ours in *Worceſterſhire*, (which I hoped ſome more ingenuous Pen would have done before this time); to ſatisfie the deſire of ſome friend, I have made as exact trialls of our Brine as I could, that I might be able in ſome meaſure to give an Anſwer to the *Cheſhire* Queries, which if they are not anſwer-

ed so fully as expected, in what I am deficient (if I may know) I shall be ready to give an Answer; in the mean time I hope my Endeavours will be accepted, and I Pardoned.

Quer. 1. What kind of Country it is where the Springs are, and what places grow about them?

Answ. The Country, is neither plain, neither hath it any great Hills, but many small risings, the greatest Hills near us being the *Lichie* within six miles, which some call *Look high*, supposing it to be the highest ground in these parts, because the Springs that rise there, run into the North and South Seas; near to which are *Clent* Hills about the same distance. On the other side the River *Severn* are *Aberly* Hills at about seven miles distance from us. There are many Salt Springs about the Town, which is seated by a Brook-side called *Salwarp*-Brook, which arise both in the Brook and in the ground near it, though there are but three Pits that are made use of.

For the Plants growing about the Springs I find no other varieties then in other places, but where the Springs are saltest there grows nothing at all, but by the brackish Ditches there grows *After Atticus* with a pale Flower, which I find no where else with us.

Quer. 2. What is the depth of the Salt Springs?

Ans. The depth of them is various; some rise on the top of the ground which are not so salt as others: those that are in the Pits we make use of are various also. The great Pit which is called *Upwich* Pit is 30 foot, deep in which are three distinct Springs rising in the bottom, one comes into the Pit North-West, another North-East, the third South-East, which is the richest both in quantity and quality: they all differ in saltness, which I can give no exact account of, it being impossible to separate them but there will be some mixture; The Pit is about 10. foot square, the sides are made with square Elms joynted in at the full length, which I suppose is occasioned by the saltness of the ground which appears to me to have been a Bog, the surface of it is made of ashes. That it was originally a Bog I am induced to believe, for not many years since digging to try the foundation of a Seal (for so we call our houses we make Salt in) I thrust a long Staff over head.

Quer. 3. Whether there are any hot Springs near? and whether the waters of the Salt Springs be colder then other water?

Answ. There are no hot Springs near us: for the coldness of the brine it is generally colder than other water, yet it never freezeth, but the rain water that lyes upon the brine (in extream hard Frosts) will freez, but not much.

Quer. 4. What kind of Earth it is? and in digging whether there are any Shells?

Answ. For Shells I never observed nor heard of any. For the nature of the Soil about the Town on the lower side it is a black rich Earth, under which

which two or three foot is a ſtiff gravelly Clay, then Marle. Thoſe that make Wells for freſh Water, if they find Springs in the Marle, they are generally freſh, but if they ſink through the Marle, they come to a whitiſh Clay mixed with Gravel, in which the Springs are more or leſs brackiſh.

Quer. 5. How ſtrong the Water is of Salt? and what quantity of Brine the Pits yeild?

Anſw. In the great Pit at *Upwich*, we have at one and the ſame time three ſorts of Brine, which we call by the names of Firſt-man, Middle-man, and Laſt-man, theſe ſorts are of different ſtrengths; The Brine is drawn by Pump, for that which is in the bottom is firſt pumped out, which is that we call firſt man, *&c.* That I might make an exact trial of the ſtrength, I made me a quart that contained 24. ounces *Troy*, of diſtilled water, which quart being filled with the firſt Brine beſides the tare of the quart weighed 29. ounces, which made 7. ounces and 3. drachms of Salt without any addition, the next day I weighed the ſame Salt again, and it weighed 7. ounces and 6. drachms, by which it appears this Brine yields above a fourth part Salt; ſo that 4 Tuns of Brine make above one Tun of Salt. The ſame quart filled with Middle-man, which is the ſecond ſort of Brine, weighed 28. ounces, I alſo weighed a quart of Brine as it came immediately out of the Springs which weighed 28. ounces and the third ſort 27. ounces, ſo that what the firſt gets the laſt looſeth, which doth precipitate as much in 24. hours as if it ſtood much longer time.

The quantity of Brine that this Pit yields every 24. hours is as much as will make 450. Buſhels of Salt, which is drawn out twice or three times a day, for ſo oft we ordinarily draw, and that as long as the Pump will goe.

In the beſt Pit at *Netherwich* a quart of Brine weighs 28. ounces and a half, this Pit is 18. foot deep, and four foot broad, and yields as much Brine every 24. hours as makes about 40. Buſhels of Salt, there is but one Spring in the Pit that comes in 2. foot and 8. inches above the bottom.

The worſt Pit at *Netherwich* is of the ſame breadth and depth as the former, a quart of Brine out of which weigheth 27. ounces and yields as much Brine dayly as makes about 30. buſhels of Salt: in this Pit are three Springs, two in the bottom, and one about two foot higher; theſe Pits are within ſix yards one of another.

Theſe Pits are near the *Brook*, the great Pit on the North ſide, and about a quarter of a mile lower the two leſſer Pits on the South ſide.

Quer. 6. Whether the Springs yield more or leſs Brine at one time than at another?

Anſw. In the great Pit I find little or no variation, either in quality or ſtrength of the Brine, but the Springs in the other Pits are augmented by much rain, and yield leſs Salt.

Quer. 7. What is the manner of their work? whether there is any thing uſed to make the Salt granulate? and what it is?

Anſw. For the manner of our Work, that every man may know his own proportion, the Brine is divided into Phats wallings, a Phat walling is divided into 12. weaker Brines, and every weaker Brine is divided into 8. burdens, every burden being a Veſſel that contains about 32. Gallons, whereof every one hath 6. burden of Firſt-man, 6. of Middle-man, and 6 of Laſt-man, ſo that every man hath not only his juſt proportion in quantity, but in quality alſo. This Brine is carried in Coolers to every mans Seal, by 8. ſworn men, which we call Maſters of the Beachin, and 4. Middle-men, and there put into great Tuns for uſe

The fuel which was heretofore uſed was all wood, which ſince the Iron-works, is ſo deſtroyed that all the Wood at any reaſonable diſtance will not ſupply the Works one quarter of the year, ſo that now we uſe almoſt all Pit-Coals which are brought to us by Land 13. or 14. miles.

For the Phats we boil our Brine in, they are made of Lead caſt into a flat plate 5. foot and a half long, and 3. foot over, and then the ſides and ends beaten up, and a little rais'd in the middle, which are ſet upon Brick-work which we call Ovens, in which is a Grate to make the Fire on, and an Aſh-hole which we call a Trunk; in ſome Seals are ſix of theſe Pans, in ſome 5. ſome 4. ſome 3. ſome 2. In each of theſe Pans is boil'd at a time as much Brine as makes 3 pecks of white Salt, which we call a Lade; and is laded out of the Pan with a Loote, which is a pannel board put ſlope-ways, on a ſtaff about 3 foot Long; and put into Barrows, which are ſet in Baſtalls over veſſels we call Leachcoms, that the Brine may run from the Salt, which Brine we call Leach, with which we dreſs our Phats when the cold Brine they firſt filled with is ſomething boil'd away, In theſe Baſtalls the Salt ſtands till it is dry which is about four hours, then we carry it into Cribs (which are houſes boarded in the bottom and ſides) where it is kept till Sold, which is ſometimes half a year or 3. quarters; in which time if the Crib is good, it will not waſte a twelfth part, the Salt it ſelf being of ſo ſtrong a body, whereas in *Cheſhire* they are forced to keep their Salt in Barrows in Stoves to dry it and make it no faſter then they ſell.

For clarifying our Salt we ſhould have little need, were it not for duſt accidentally falling into the Brine. The Brine of it ſelf being ſo clear that nothing can be clearer: for clarifying it we uſe nothing but the Whites of Eggs, of which we take a quarter of a White, and put it into a gallon or two of Brine, which being beaten with ones hand, lathers as if it were Soap, a ſmall quantity of which froth put into each Phat, raiſeth all the ſcum, (ſo that the White of one Egg will clarifie 20. buſhels of Salt) by which means our Salt is as white as any thing can be, neither

ther hath it any ill ſavour, as that Salt hath that is clarifi.d with b'ood.

For granulating it we uſe nothing at all, for the Brine is ſo ſtorrg of it ſelf, that unl.ſs it be often ſtirred, it will make Salt as big grained as Bay-ſalt. I have boyl'd Brine to a Candy hight, and it hath produced clods of Salt as clear as the cleareſt Alum, like Iſle of *May* Salt, ſo that we are neceſſitated to put a ſmall quantity of Roſin into the Brine to make the grain of the Salt ſmall.

Quer. 8. What are the ſeveral ſorts of Salt?

Anſw. Beſides the white Salt I have ſpoke of, we have another ſort which we call Clod-Salt, which grows to the bottoms of the Phats that after the white Salt is laded out, is digged up with a picker (which is made like a Maſons Trowel, pointed with Steel and put upon a ſhort ſtaff) this is the ſtrongeſt Salt I have ſeen, and is moſt uſed for ſalting Bacon and Neats Tongues, it makes the Bacon redder than other Salt, and makes the Fat eat firm: if the Swine are fed with Maſt, it hardens the Fat almoſt as much as if fed with Peaſe, and ſalted with white Salt. It is very much uſed by Countrey women to put into their Runnet-Pots and (as they ſay) is better for their Cheeſe: theſe clods, are uſed to broil meat with being laid on coals, we account this Salt to be too ſtrong to ſalt Beef with, it taking away too much of its ſweetneſs.

A third ſort of Salt we have which we call Knockings, which doth candy on the Stailes of the Barrow, as the Brine runs from the Salt after it is laded out of the Phats: this Salt is moſt uſed for the ſame uſes as the clod Salt, though it is not altogether ſo ſtrong.

A fourth ſort we have which we call Scrapings, that is a courſe ſort of Salt that is mixed with droſs and duſt that cleaves to the tops of the ſides of the Phats, this Salt is ſcraped off the Phats when we reach them (that is when we take our Phats off the Fires to beat up the bottom) and is bought by the poor ſort of people to ſalt meat with.

A fift ſort is Pigeon Salt, which is nothing but the Brine running out through the crack of a Phat, and hardens to a clod on the outſide over the fire.

Laſtly, the Salt Loaves are the fineſt of the white Salt, the grain of which is made ſomething finer then ordinary that it may the better adhere together, which is done by adding a little more Roſin, and is beaten into the Barrows when it is laded out of the Phat.

Quer. 9. Whether our Salt be more or leſs apt to diſſolve in the air than other Salt?

Anſw. It is not ſo apt to diſſolve, as *Cheſhire* Salt, nor as that Salt that is made by diſſolving Bay-Salt and clarifying it, which is called Salt upon Salt, which appears by our long keeping it without any fire. Whether it will keep better than French Salt I have made no trial, but I ſuppoſe it will, for ſuch reaſons I ſhall give in anſwer as to the goodneſs of our Salt.

Quer.

Quer. 10. Whether our Salt be as good to powder Beef or other Flesh as *French* Salt?

Answ. It is, and I believe there cannot be better white Salt then ours for several Reasons.

1. There is none can be whiter, and consequently more free from dross.

2. It is the weightiest as I have seen my self, and been informed by others, for the baggs of Salt I have usually seen brought out of *Cheshire* on Horseback, contain 6. bushels and a half or 7. bushels, whereas the best Horses that carry Salt from hence (if they carry it above 5. miles) carry not above 3. strike and 3. pecks, or 4. strike. A *Winchester* bushel of our Salt weighs half a hundred weight, so that it must necessarily follow, the weightyest and driest must needs be the best.

3. In the time of the first *Dutch*-Warr, our Salt was carried down into the West, where they had before none but forreign Salt, where at the first using ours, they complained that it made their meat too salt, which was because they put as much of ours on their meat as of others: if so, it must be better then *French* Salt. This account I had from him hat carried our Salt into those parts.

t 4. I have been assured by many that have made use both of ours, and *Cheshire* Salt, that both for Flesh and white-meat they must lay on more of *Cheshire* Salt then ours.

5. It doth preserve all sorts of Flesh for long Voyages, *viz.* to *Jamaica*, as well as any, which hath been lately tried.

6. I have seen Herrings that have been salted with our Salt in *Ireland*, and brought over to this Town, which have been whiter and better tasted than those salted with Bay Salt.

7. It is an ordinary way of powdering Beef with us, to give it but one Salting to keep it the whole year.

If it is asked why we use not Iron-Pans as in *Cheshire* and other places? There have been tryals made both of forged Iron-Pans and cast-Iron. The former the strength of the Brine doth so corrode, that it quickly wears them out; the latter the Brine breaks.

SIR, If there is any thing more of which you desire an information, I shall (if I may know it) indeavour to inform you, that am

Droytwitch *March* the 16th. 1678.

Your humble Servant

THO. RASTEL.

The

The Deſcription, Culture, and Uſe of Maiz. Communicated by Mr. Winthorp.

THe Corn, uſed in *New-England* before the *Engliſh* Planted there, is called by the Natives, *Weachin*, known by the name of *Maiis* in ſome Southern parts of *America*, where, and even in the Northern parts, amongſt the *Engliſh* and *Dutch*, who have plenty of Wheat and Grain, this ſort of Corn is ſtill much in uſe both for Bread, and other kind of food.

The Ear is for the moſt part, about a ſpan long, compoſed of ſeveral, commonly 8. rows of Grains, or more, according to the goodneſs of the Ground; and in each row, uſually above 30. Grains. Of various colours, as Red, White, Yellow, Blew, Olive, Greeniſh, Black, ſpecked ſtriped, *&c.* ſometimes in the ſame field, and the ſame Ear. But the White and Yellow are the moſt common.

The Ear is cloathed and armed with ſeveral ſtrong thick Husks. Not only defending it from the Cold of the Night (being the latter end of *September* in ſome parts before it be full ripe) and from unſeaſonable Rains: but alſo from the Crows, Starlings and other Birds; which being allured by the ſweetneſs of the Corn before it hardneth, come then in great flights into the fields, and pecking through the top of the Cover, devour as far as they can reach,

The Stalk groweth to the hight of 6. or 8. feet; more or leſs, according to the condition of the Ground, or kind of Seed. The *Virginian* groweth taller than that of *New England*. And there is another ſort uſed by the Northern Indians far up in the Country, that groweth much ſhorter than that of *New-England*. 'Tis always joynted like a Cane. And is full of ſweet juice, like the Sugar-Cane. And a Syrup as ſweet as Sugar may be made of it; as hath been often try'd. And Meats ſweetned with it, have not been diſtinguiſhed from the like ſweetned with Sugar. Trial may eaſily be made, whether it will not be brought to Cryſtallize or ſhoot into a Saccharine Powder, as the juice of the Sugar-Cane.

At every joynt there are long Leaves almoſt like flags, and at the top, a bunch of flowers, like the bloſſoms of Rye.

It is Planted between the middle of *March* and the beginning of *June*. But moſt commonly from the middle of *April* to the middle of *May*. Some of the Indians take the time of the coming up of a Fiſh, called *Aloofes*, into the Rivers. Others of the budding of ſome Trees.

In the pure Northerly parts, they have a peculiar kind calld *Mohauks* Corn, which though planted in *June*, will be ripe in ſeaſon. The ſtalks of this kind are ſhorter, and the Ears grow nearer the bottom of the ſtalk, and are generally of divers colours. The

The manner of Planting is in Rows, at equal distance every way, about 5. or 6. feet. They open the Earth with an Howe, taking away the surface 3. or 4. inches deep, and the bredth of the Howe; and so throw in 4. or 5. Granes, a little distant one from another, and cover them with Earth. If two or three grow, it may do well. For some of them are usually destroyed by Birds, or Mouse-Squirrels.

The Corn grown up an hands length, they cut up the weeds, and loosen the Earth, about it, with a broad Howe: repeating this labour, as the Weeds grow. When the Stalk begins to grow high, they draw a little Earth about it: and upon the putting forth of the Eare, so much, as to make a little Hill, like Hop-Hill. After this, they have no other busines about it, till Harvest.

After 'tis gather'd, it must, except laid very thin, be presently stripped from the Husks; otherwise it will heat, grow mouldy, and sometimes sprout. The common way (which they call Tracing) is to weave the Ears together in long Traces by some parts of the Husk left thereon. These Traces they hang upon Stages or other Bearers within doors, or without; for, hung in that manner, they will keep good and sweet all the Winter after, though exposed to all weathers.

The Natives commonly Thresh it as they gather it, dry it well on Mats in the Sun, and then bestow it in holes in the Ground (which are their Barns) well lined with withered Grass and Matts, and then covered with the like, and over all with Earth: and so its kept very well, till they use it.

The *English* have now taken to a better way of Planting by the help of the Plough; in this manner; In the Planting time they Plough single Furrows through the whole Field, about 6. feet distant, more or less, as they see convenient. To these, they Plough others a cross at the same distance. Where these meet they throw in the Corn, and cover it either with the Howe, or by running another Furrow with the Plough. When the Weeds begin to overtop the Corn, then they Plough over the rest of the field between the Planted Furrows, and so turn in the Weeds. This is repeated once, when they begin to Hill the Corn with the Howe; and so the Ground is better loosened than with the Howe, and the Roots of the Corn have more liberty to spread. Where any Weeds escape the Plough, they use the Howe.

Where the Ground is bad or worn out, the Indians used to put two or three of the forementioned Fishes, under or adjacent to each Corn-hill, whereby they had many times a Crop double to what the Ground would otherwise have produced.

The *English* have learned the like Husbandry, where these *Aloofes* come up in great plenty, or where they are near the Fishing-stages; having there the Heads and Garbage of Cod-fish in abundance, at no charge but the fetching.

The

The Fields thus Ploughed for this Corne, after the Crop is off, are almoſt as well fitted for *Engliſh* Corn, eſpecially Summer Grain, as Peaſon or Summer Wheat; as if lying fallow, they had had a very good Summer Tilth.

The Indians, and ſome *Engliſh* (eſpecially in good Ground, and well fiſhed) at every Corn-hill, plant with the Corn, a kind of *French* or *Turkey* Beans: The Stalks of the Corn ſerving inſtead of Poles for the Beans to climb up with. And in the vacant places between the Hills they will Plant Squaſhes and Pompions; loading the Ground with as much as it will bear. And many, after the laſt weeding, ſprinkle Turnep-ſeed between the Hills, and ſo, after Harveſt, have a good Crop of Turneps.

The Stalks of this Corn, cut up before too much dryed, and ſo laid up, are good Winter-fodder for Cattle. But they uſually leave them on the Ground for the Cattle to feed on. The Husks about the Ear are good Fodder, given for change ſometimes after Hay.

The Indian women ſlit them into narrow parts, and ſo weave them artificially into Baskets of ſeveral faſhions.

This Corn the Indians dreſſed ſeveral ways for their food. Sometimes boyling it whole till it ſwelled and became tender, and ſo either eating it alone, or with their Fiſh or Veniſon inſtead of Bread. Sometimes bruiſing in Mortars, and ſo boyling it. But commonly this way, *viz.* by parching it in Aſhes, or Embers, ſo artificially ſtirring it, as without burning, to be very tender, and turned almoſt inſide outward, and alſo white and flowry. This they ſift very well from the Aſhes, and beat it in their wooden Mortars, with a long Stone for a Peſtle, into fine Meal. This is a conſtant food at home, and eſpecially when they travel, being put up in a Bag, and ſo at all times ready for eating either dry or mixed with Water. They find it very wholſom Diet. And is that, their Souldiers carry with them in time of War. The *Engliſh* ſometimes for novelty, will procure ſome of this to be made by the *Indian* women, adding Milk or Sugar and Water to it, as they pleaſe.

The Indians have another ſort of Proviſion out of this Corn, which they call Sweet-Corn. When the Corn in the Ear is full, while it is yet green, it hath a very ſweet Taſt. This they gather, boyl, and then dry, and ſo put it up into baggs or baskets, for their uſe: boiling it again, either whole or groſly beaten, when they eat it, either by it ſelf, or amongſt their Fiſh or Veniſon or Beavers, or other Fleſh; accounting it a principal Diſh.

Theſe green and ſweet Ears they ſometimes roaſt before the Fire or in the Embers, and ſo eat the Corn. By which means, they have ſufficient ſupply of food, though their old Store be done. Their Souldiers alſo moſt commonly at this time goe out againſt their Ene-

mies, having this ſupply in their Marches both at home and in the Enemies fields.

The *Engliſh*, of the full ripe Corn, ground, make very good Bread. But 'tis not ordered as other Corn. For if it be mixed into ſtiff Paſte, it will not be ſo good, as if made only a little ſtiffer than for Puddings; and ſo baked in a very hot Oven, ſtanding therein all day or all night. Becauſe upon the firſt pouring of it on the Oven-floor, it ſpreads abroad, they pour a ſecond layer or heap upon every firſt, and thereby make ſo many Loves. Which if baked enough, and good, will be of a deep yellowiſh colour; if otherwiſe, white.

It is alſo ſometimes mixed with half or a third part of Rye or Wheat Meal, and ſo with Leaven or Yeſt made into Loaves of very good Bread.

Before they had Mills, having firſt watered and Husked the Corn, and then beaten it in Wooden Mortars; the courſer part ſifted from the Meal, and ſeparated from the looſe Hulls by the Wind, they boyled to a thick Batter: to which being cold, they added ſo much of the fine Meal, as would ſerve to ſtiffen it into Paſt, whereof they made very good Bread.

But the beſt ſort of Food which the *Engliſh* make of this Corn, is that they call *Samp*. Having firſt watered it about half an hour, and then beaten it in a Mortar, or elſe ground it in a Hand or other Mill, into the bigneſs of Rice, they next ſift the Flower, and Winnow the Hulls from it. Then they boyl it gently, till it be tender, and ſo with Milk or Butter and Sugar, make it into a very pleaſant and wholſom Diſh. This was the moſt uſual Diet of the firſt Planters in theſe Parts, and is ſtill in uſe amongſt them, as well in Feavers, as in Health: and was often preſcribed by the Learned Dr. *Wilſon* to his Patients in *London*. And of the *Indians* that live much upon this Corn, the *Engliſh* moſt acquainted with them, have been informed by them, That the Diſeaſe of the Stone is very ſeldom known amongſt them.

The *Engliſh* have alſo found out a way to make very good Beer of Grain: that is, either of Bread made hereof, or elſe by Malting it. The way of making Beer of Bread, is by breaking or cutting it into great lumps about as big as a mans fiſt, to be maſh'd, and ſo proceeded with as Malt, and the impregnated Liquor, as Woort, either adding or omitting Hopps, as is deſired.

To make good Malt of this Corn, a particular way muſt be taken. The Barly-Malt-Maſters have uſed all their skill to make good Malt hereof the ordinary way; but cannot effect it; that is, that the whole Grain be Malted, and tender and flowry, as in other Malt. For it is found by experience, that this Corn, before it be fully Malted, muſt ſprout out both ways, (*i.e.* both Root and Blade), to a great length; of a finger at leaſt; if more, the better. For which, it muſt be laid upon an heap

heap a convenient time. Wherein on the one hand, if it lyeth of a ſufficient thickneſs for coming, it will quickly heat and mould, and the tender Sprouts be ſo intangled, that the leaſt opening of the Heap breaks them off; and ſo hinders the further maturation of the Grain into Malt. On the other, if it be ſtirred and opened to prevent too much heating, theſe ſprouts which have begun to ſhoot, ceaſe growing, and conſequently the Corn again ceaſeth to be promoted to the mellowneſs of Malt.

To avoid all theſe difficulties, this way was try'd and found effectual: Take away the top of the Earth in a Garden or Field two or three inches, throwing it up half one way, and half the other. Then lay the Corn, for Malt, all over the Ground ſo as to cover it. Then cover the Corn with the Earth that was pared off; and there is no more to do, till you ſee all the Plot of Ground like a green Field covered over with the Sprouts of the Corn, which will be within ten days or a fortnight, according to the time of the year. Then take it up, and ſhake the earth from it and dry it. For the Roots will be ſo intangled together, that it may be raiſed up, in great pieces. To make it very clean, it may be waſhed, and then preſently dry'd on a Kiln, or in the Sun, or ſpread thin on a Chamber floor. This way, every Grain that is good will grow, and be mellow, flowry and very ſweet; and the Beer made of it, be wholſom, pleaſant, and of a good brown colour.

Yet Beer made of the Bread, as aforeſaid, being as well coloured, as wholſom and pleaſant, and more durable; this therefore is moſt in uſe. And the rather, becauſe the way of Malting this Corn, laſt deſcribed, is as yet but little known amongſt them.

An Account of the manner of making Malt in Scotland; *by Sir* Robert Moray.

MAlt is there made of no other Grain, but Barley. Whereof there are two kinds; one, which hath four Rows of Grains on the Ear; the other, two Rows. The firſt is the more commonly uſed; but the other makes the beſt Malt.

The more recently Barly hath been Threſhed it makes the better Malt. But if it hath been Threſhed ſix weeks or upwards, it proves not good Malt, unleſs it be kept in one equal temper; whereof it eaſily failes, eſpecially if it be kept up againſt a Wall: for that which lies in the middle of the Heap is freſheſt, that which lies on the outſides and at top is over dry'd, that which is next the Wall ſhoots forth, and that which is at the bottom Rots. So that when it comes to be made into Malt, that which is ſpoiled, does not *Come* well (as they call it) that is, never gets that right mellow temper Malt ought to have, and ſo ſpoils all the reſt. For thus ſome Grains *Come* well, ſome not at all, ſome half, and ſome too much.

The beſt way to preſerve Treſhed Barly long in good temper, is, Not to ſeparate the Chaff from it. But as long as it is unthreſhed, it is always good. Brewers uſe to keep their Barly in large Rooms on boarded floores, laid about a foot in depth, and ſo turned over now and then with Scoops.

Barly that hath been over heated in the Stacks or Barnes, before it be ſeparated from the Straw, will never prove good for Malt, nor any other uſe. But though it heat a little after it is Threſhed, and kept in the Chaff, it will not be the worſe, but rather the better for it; for then it will *Come* the ſooner, and more equally.

A mixture of Barly that grew on ſeveral grounds, never proves good Malt, becauſe it *Comes* not equally. So that the beſt Barley to make Malt of, is that which grows in one Field, and is kept and threſht together.

Take then good Barley, newly threſhed, and well purged from the Chaff, and put hereof eight Boles, that is, about ſix *Engliſh* Quarters, in a Stone-Trough. Where let it infuſe, till the water be of a bright reddiſh colour; which will be in about three days, more or leſs, according to the moiſtneſs or dryneſs, ſmalneſs or bigneſs of the Grain, ſeaſon of the Year, or temper of the Weather. In Summer Malt never Makes well. In Winter it will need longer infuſion, than in the Spring or Autumn.

It may be known when ſteeped enough, by other marks beſides the colour of the Water, as the exceſſive ſwelling of the Grain, or, if over ſteeped, by too much ſoftneſs; being, when in the right temper, like that Barley which is prepared to make Broath of, or the Barley called by ſome, *Urge wonder.*

When the Barley is ſufficiently ſteepd, take it out of the Trough, and lay it on heaps, ſo let the Water drein from it. Then after two or three hours, turn it over with a Scoop, and lay it in a new heap about twenty or twenty four inches deep. This Heap they call the *Comeing Heap.* And in the managing of this Heap aright, lies the greateſt Skill. In this Heap it will lie forty hours, more or leſs, according to the formentioned qualities of the Grian, *&c.* before it come to the right Temper of Malt; which that it may all do equally, is moſt to be deſired.

Whilſt it lies in this Heap, it is to be carefully looked to, after the firſt fifteen or ſixteen hours. For about that time, the Grains will begin to *put forth the Root*, which when they have equally and fully done, the Malt muſt, within an hour after, be turned over with a Scoop; otherwiſe the Grains will begin to put forth the Blade or Spire alſo, which by all means muſt be prevented: for hereby the Malt will be utterly ſpoil'd, both as to pleaſantneſs of Taſt, and ſtrength.

If

If all the Malt *Come* not equally, becauſe that which lies in the middle being warmeſt, will uſually *Come* firſt; turn it over, ſo as the outmoſt may lie inmoſt, and ſo leave it till all be *Comen* alike.

So ſoon as the Malt is ſufficiently *Come*, turn it over, and ſpread it to a depth not exceeding five or ſix inches. And by that time it is all ſpread out, begin and turn it over and over again, three or four times. Afterwards, turn it over in like manner, once in four or five hours, making the Heap thicker by degrees, and continuing ſo to do conſtantly, for the ſpace of forty eight hours at leaſt.

This frequent turning of it over, cooles, drys and deads the Grain; whereby it becomes mellow, melts eaſily in brewing, and then ſeparates entirely from the Husk.

Then throw up the Malt into a Heap, as high as you can. Where let it lye, till it grows alſo hot as your hand can endure it: which uſually comes to paſs, in ſome thirty hours ſpace. This perfects the ſweetneſs, and mellowneſs of the Malt.

After the Malt is ſufficiently heated, throw it abroad to cool, and turn it over again about ſix or eight hours after, and then dry it upon the Kiln. Where, after one fire, which muſt ſerve for twenty four hours, give it another more ſlow, and if need be, a third. For if the Malt be not thoroughly dryed, it cannot be well ground, neither will it diſſolve well in the brewing, and the Ale it makes will be red, bitter, and will not keep.

The beſt Fewell, is Peat. The next Charcoale, made of Pit-Coal or Cinders; Heath, Broom and Furzes are naught. If there be not enough of one kind, burn the beſt firſt, for that gives the ſtrongeſt impreſſion, as to the Taſt.

ANTI-

ANTIΔIATPIBH,

Sive Animadverſiones in Malachiæ Thruſtoni *M. D. Diatribam de Reſpirationis Uſu primario.*

Auctore Georgio Entio, *Eq. aur. M.D. & Col.* Lond. *Soc. in* Oct. 1679.

IN this Book (beſides the Anatomical Obſervations) ſeveral opinions are propoſed and defended with the known Elegancy and Learning of the Author. I ſhall here ſet them down in the order I find them; and for the Arguments refer the Reader to the Book it ſelf: leaſt I ſhould either do wrong to the Author, or tranſcribe the whole.

It ſeems probable, ſaith our Author, that the finer part of the Alimentary Juice, is tranſmitted from the Stomach and Guts, by mediation of ſmall concave Fibres thereto annexed, (and of which the Body chiefly conſiſteth) to the ſeveral Parts for their nouriſhment. page 8, 11.

That the ſame Alimentary Juice, is that which in the uſe of Vomitories and Catharticks, is by the ſame Concave Fibres diſgorged into the Stomack and Guts: and not by Lacteal Veins, or the Arteries. page 8.

That the Water or Serum which is extravaſated in Hydropick perſons, iſſues not from the ſanguiferous Veſſels. But that it is the Nutritious Juice it ſelf, which either by an Ulcer in ſome Meſenterick Gland, which is not unuſual, or an Aperture in ſome *Lymphæduct*, oozes into the Cavity of the *Abdomen*. page 10.

That the Febrifick matter in Intermittents, is not lodged originally in the the Blood. page 10.

That the *Pituita* ſuppoſed by Dr. *Gliſſon* and others to be ſpued out of the Arteries (as having there no further uſe) into the Coats of the Stomack; is this very Nutritious Juice, tending to other Parts of the Body, but upon the death of the Animal, by cold and ſlower motion condenſed, and there arreſted in its way. page 10.

That after the ſame manner Milk is alſo transferred to the Breaſts. page 10.

That neither in Abſceſſes, nor in any other Caſe, it is the extravaſated Blood

Blood that ſuppurates, but only the Nutritious or Alimentary Juice. page 12, 13, 32. That accordingly in the Small Pox, the purulent Matter is not derived or bred out of the Blood, but out of the aforeſaid Juice. So that if a Woman with Child hath the Small Pox, the Child is found to have them too: though not one drop of the Mothers Blood paſſeth into the Child. page 13.

That the Membranes and Nerves ſuck in their nouriſhment from the Glands of the Mouth and Throat, while we chew our Meat. page. 18.

That after it is concocted in the Stomach, part of it is filtrated and transferred by the *Oeſophagus* or Gullet to the Brain. page 18. From whence it is alſo derived to the Nerves and Membranes, eſpecially the *Membrana Carnoſa* originated of the *Pia Mater*. page 19.

That the *Colliquamentum*, which firſt appears in a Setting Egg, is the groundwork or beginning of the Brain. page 22.

That the Blood ſerves not to nouriſh the Body, but only to foment it, as it were, or keep it warm. page. 33, 154.

That Generation is *Opus Ideale*, and the *Semen* not to be taken for an Extract from the ſeveral Parts. For Viviparous Animals have a *Placenta*, to which there is nothing analogous in either Parent, *&c.* page 40, 41.

That the Puls is rather the Vibration, by a continuation of the motion from the Heart, then the Intumeſcence of the Artery. page 47.

That Urine is not derived to the Reins by the Emulgent Arteries (which bring the Blood only to cheriſh and keep them warm.) but by the Nerves. In favour whereof divers Arguments are propoſed from page 62. to 67.

That what are called the Lungs of a Frog, are only Wind-Bladders, analogous not to Lungs, which in a Frog are no where found, but to that Part, which in Fiſhes is commonly called the Swim. page 69.

That the primary uſe of Reſpiration, is not to carry off fuliginous ſteams from the Blood, but for the ventilation of the Vital flame in the Heart or Blood, and ſupplying it with proper fuel. page 72.

That 'tis a vulgar error, That the Action of Exſpiration is performed more ſlowly, than of Inſpiration. page 72.

That in the tip of an Indian naked Dogs Ear, there are no Muſcles found, although he command it into various and nimble motions page 73.

That the only uſe of the *Diaphragm*, is to facilitate Reſpiration by guarding the Heart and Lungs, that the lower *Viſcera* do not throng in upon them. page 74.

That Reſpiration is not needful to the motion or circulation of the Blood. page 87.

That although heretofore our Author thought the Air in Inſpiration

to

to be mixed with the Blood; yet he saith, that after several Experiments made, he could not by any good Argument evince the same. page 93.

He hath made the Experiment, That Whey tinged with Saffron, being injected into the *Pulmonary* Artery, imediately runs into the left Ventricle of the Heart, without the assistance of Inspiration. Neither doth any Blood at the same time break forth into the Lungs. p. 101. He saith further,

He supposeth, that Animal Motions, are not made by the influence of the Animal Spirits. But that in each Part is seated a private sense, which is under the command of the Soul. And that therefore there are no Animal Spirits, but those in the Blood, called by the Name of the *Calor Nativus*. In favour whereof many Arguments are offered from p. 123, to 141.

That the suspension or Intermission of Inspiration for a certain time, doth not alter the Puls. p. 145.

That the Cause of Transparency is to be refer'd to the Texture of the transparent Body, and its Aptitude to continue the Motion by which Light is made, p. 179. Much after the same manner, as Sound is ontinued through a Window or a Wall, p. 180. And that therefore the Rays of Light do not pass through a diaphanous Body, p. 184.

That Colours arise from the sparing or copious, strong or languid Reflections of Light from Bodies variously figured; as sounds from strings variously sized or stop'd, p. 185. So that the Nature of Light, is as if one should cause all the strings of a Viol to Vibrate together, so as to make one continued sound: that of Colours, as if their Vibrations were distinguished by divers and successive stops, p. 188.

LONDON,

Printed for *John Martyn*, Printer to the *Royal Society*. 1679.

A

AIr, *in* Ireland *and in all the* Englifh *Colonies in* America *much alter'd by the culture of land, and by the increafe of* Englifh *Inhabitants. And the* Air *of* Dublin *examined for weight by the Baroſcope*, n. 127. p. 649, 650. *Compare this with the advice from* Rome *for the ſalubrity of places*, n. 66. *Two Hygroſcopes newly deviſed, to examine the* Air, *with ſome Obſervations*, n. 126, p. 650, *and* n. 129. p. 715. *Of human life long ſuſtain'd under water without* air, n. 127. p. 675. *The* Air *of* Gomron *peſtilent*, n. 129 p. 711.

Agriculture: *Nurſeries, profitable Gardens, Orchards and Vineyards, ſollicited for* Cambridge *and the North*, n. 129. p. 728. *Wines made of* Engliſh *fruits*, n. 123. p. 574. *Advertiſements on the ſame*, n. 124. p. 583 *How Tobacco is planted and order'd in* Virginia, n. 126. p. 634. *To adorn Woods, Groves, and the avenues of fair Manſions*, n. 126. p. 644.

Anatomy; *concerning the Spiral, inſtead of the hitherto ſuppoſed Annular, ſtructure of the Fibers of the Inteſtines, by Dr.* Cole, n 125 p. 603. *Of the Ventricle and Inteſtines, by Dr.* Gliſſon, n. 128. p. 705. *Opthalmographia, by M.* Briggs, n. 129 p. 746. *A new ſtructure of the Diaphragm, and a method of preparing the Bowels, by* Caſpar Bartholin, n. 130. p. 768. *The Anatome of ſome Animals at* Paris, n. 124 p. 591. *Dr.* Grews *Anatome of Plants vindicated*, n. 127. p. 657.

Anſwers: *Dr.* Hodgſons *Anſwers to Mr* Boyles *Inquiries concerning the Subterraneous Fires in the Coal-mines near* Newcaſtle, *&c.* n. 130. p. 761.

Antiquities: *The* Britans *deſcended from the* Cimbrians, *and firſt diſcover'd by the* Phœnicians, n. 124. p. 596, 598. *The Idol Temples and other Heatheniſh monuments of Old* Greece *preſerved undemoliſh'd under the* Turks *Dominion*, n. 124. p. 575. *The Antiquity of* our *Baths and thoſe of* Aquiſgran *compared*, n. 123. p. 574. *The Conſent of Ancient and Modern Philoſophy*; n. 123. p. 570. *The* Carteſian *prefer'd to the* Ariſtotelian, 131. 790. *The means to reconcile Chronologers*, n. 131. p. 793. *Palæologia Chronica*, n. 132. p. 808. *A Mathematico-hiſtorical Table; See* Artific. *That at* Boutan *in the* Mogols *Dominions they had the uſe of Muskets, Canon, and Powder, many Ages ago; ſome Canon now remarked above* 500 *years old* n. 130. p. 756.

Artifices: *Hygroſcopes, See* Air. *The* Pariſian *Water-Engin to quench fires*, n. 128. p. 679. *A factitious Stone which imbibes any ordinary day- or candle-light, and for a time retains a fire-like luminouſneſs in any dark place*, n. 131. p. 788. *To improve Teleſcopes*, n. 128. p 691. *Sugar-Wines drawn from Plants and Fruits, and to dry all wholeſome fruit*, n. 128. p. 583. *How the* Germans *make Braſs of* Lapis Calaminaris, 130. 768. *A magnificent Throne in* Denmark *made of huge Horns of Fiſhes, which are there call'd* Unicorns *horns*, 130. 766 *The great Veſſel at* Heidelberg *deſcribed*, ibid. *An Eſſay to explain the phænomenon of the Inclinatory Needle, towards the finding the Longitude*. 130. 774. *The Steel of* Golconda *beſt to be damaskined, and how order'd*, 129 715. *A* Talc *in* Perſia *tinged, and mingled with Chalk well ſteaked, makes Walls ſhine* Jaſpis-*like*, ib p. 714. *The beſt Glue made of* Sturgeon, *and how order'd*, ibid. *How to try true* Bezoar, 130. 757. *Strange magical Jugling*, ib. p. 752. *A Mathematico-hiſtorical Table deſign'd*, 127. 667.

Aſtronomy: *Sign.* Caſſini *on the Lunar Eclipſe*, Dec. 21. 1675. *ſt. v. and the Occultation of a Fixt ſtar by the Moon*, n. 123. p. 565. (*compare* n. 121. p. 495.) *Mr.* Flamſteads *anſwer to* Caſſini, n. 129. p. 565. *Monſ.* Hevelius *on the Lunar Eclipſe*, Jan. 1. 1676. *ſt. n.* n. 124 p. 590. Mercatoris *Inſtitut. Aſtrono-*

ſtronomicæ, n.125 p.611. Hevelius *on the Solar Eclipſe*, Jun. 23. 1675. *ſt. n.* 127.661. Flamſtead, Townley, Halley, *on the Solar Eclipſe*, Jun. 1 1676. ib.p.662. Caſſini *on the ſame*, ib.p. 669. Hevelius *on the ſame*, ib.p.666. Caſſini's *advertiſement about the configuration of* Jupiters *Satellites for the years* 1676, 1677. n 128.p.681. *A direct and Geometrical method for finding the Aphelions, Eccentricities and proportions of the Orbs of the primary Planets, without ſuppoſing the Equality of the Angle of Motion at the other Focus of the Planets Ellipſis, by Mr.* Halley 128.683. Hevelius *of the figure of* Saturn *in* Aug. 1675, n.127. p.661. Caſſini *adds a zone about* Saturn, *as about* Jupiter, *but more obſcure*, n.128 p.690. Caſſini *remarks a huge Spot in the Sun*, 127.665. Flamſtead *and* Halley *on the ſame*, 128.687. Caſſini *on the ſame again*, ib.p.689. Smethwick *on the Solar Eclipſe*, Jun. 1. 1676. *ſt. v.* n.126 p.637. *approv'd by* Caſſini, 127.665. *This obſerv'd at* Weſtminſter *by M.* Smethwick; *Mr.* Colſon, *at Wapping, on the ſame*, p. 723. *Mr.* Halley, 724 *M.* Bullialdus *and M.* Richelts *on the Lunar Eclipſe of* Jan. 1. 1676. n. 125. p.610. *A Comet, or New Star, or changing Stars ſaid to be ſeen*, n.123 p.565, 567.

Animals, *in* Paris *diſſected*, n.124. p.591. *Animals in* Virginia, n.126. p.624, 630; *at* Comorin, Coromandel, Balſara, 129 713, 714.

Perſian *Animals*: Camels *forbear drink 9 days; carry* 1000 l. *yea* 1500 l. *weight*, n.129. p.713: Cows *having no graſs to feed on there, are fed with heads of fiſhes and dates boiled together*, p.714. Porcupins *kill* Lions *by ſhooting quills into their bodies*, ibid.

Mogollian *Animals*; *How* Elephants *prepare for generation*, n.130. p 753: *The Musk-animal; the Bezoar-animal; the Porcupin-ſtone*, ib.756, 757. Eele-*like Inſects bred and ſwimming in good pleaſant Wine*, n.127. p.656. *Worms falling down with Snow in* Hungary, 129. 742. *A fomentation made of a decoction of* Emmets *very Antiparalytical*, 129.743. *Anatome of a* Tortoiſe, *many ſingularities*, ibid.

B

BAthes *of* England *and* Aquisgran *compared*, n.123. p.573.

Bezoar, *whence, and how to be tried*, 130.756. *The Mineral* Bezoar, *and its Medical uſes in* Sicily, 127. 672.

Books,

The Royal Almanack, n.130. p.774.

Animals *diſſected at* Paris, 124.590.

W. Badcock's *Touch-ſtone for Gold and Silver wares*, 132. 814.

Th. Bartholin. *de Peregrinat. Medica*, 127.671.

Caſp. Bartholini *de Diaphragm. ſtructura nova, unà cum Methodo præparandi Viſcera* 130.768.

Bathonienſium & Aquiſgranenſium *Thermarum comparatio, variis adjunctis illuſtrata à R.P.* 123.575.

M. de Blegny *of the Venereal Diſeaſe*, 125.622.

M. Bond *of Longitudes*, 130.774.

Mr. Boyles *Experiments and Notes about the Mechanical Origin and production of divers particular Qualities: Among which is inſerted a diſcourſe of the Imperfection of the Chymiſts doctrine of Qualities; with ſome Reflexions upon the Hypotheſis of* Alcali *and* Acidum. *The Qualities here conſider'd, are, Heat and Cold, Taſts, Odors, Volatility, Fixedneſs, Corroſiveneſs and Corroſibility, Chymical precipitation, Magnetiſm, and Elaſticity*, 127.669.

Mr. Brigg's *Ophthalmographia*, 129. 746.

Dr. Edw. Brown's *Account of his Travels through a great part of* Germany, 130.767.

Henr. Buſſchof, *from* Batavia *in the* Eaſt-Indies, *of the Gout and its cure by* Moxa, 125.621.

Dr.

Dr. Carews *Palæologia Chronica*, n.132.p.808.

Monſ. Charas *Pharmacopee Royale, Galenique & Chymique*, 126.711.

Monſ. du Clos, *ſur les Eaux Minerales des pluſieurs Provinces de* France, 125.612.

Mr. Cook, *of the Manner of raiſing, ordering and improving Forreſts, Woods, Groves, to adorn Avennes; with proper Inſtructions in Arithm. and Geometry*, 126.644.

Of Education, *chiefly of Gentlemen*, 123 572.

Ephemeridum Medico-phyſicarum *Germanicarum Ann.* 4, *&* 5. *cum Appendice*. 129.742.

Fr. Gliſſonius *M.D. de Ventriculo & Inteſtinis, nec non de partibus continentibus in genere, & in ſpecie de partibus Abdominis*, 128.705.

J.B. du Hamel *de Conſenſu Vet. & Novæ philoſophiæ*, 123.570.

M. de la Hire *Nouvelle Methode en Geometrie pour les Sections des Superficies Coniques & Cylindriques, qui ont pour baſe des Circles, ou des Paraboles, des Ellipſes & des Hyperboles*, 129.745.

Anth. Lawrence, *Nurſeries, profitable Gardens, Orchards and Vineyards ſolicited for* Cambridge *and the Champian Countries, and the North*, 129.745.

Mr. Mercator, *S.R.S. Inſtitut. Aſtronomicæ*, 125.611.

La Meſure de la Terre, 124.569. *compare with this* n. 112, *and* 126. p. 636.

Dr. Megerlins *Mathematico-hiſtorical Table deſigned*, 127.667.

Monſ. Menard: *Nouvelle Science des Temps, ou Moyen general de concilier les Chronologues*, 131.793.

Dr. Molimbrochii *Cochlearia curioſa, Engliſhed*, 125 621.

L'Art de Parler, 125.642.

Monſ. Preſtet, *Elemens de Mathematiques, ou Principes generaux de toutes les Sciences, qui ont les Grandeurs pour Object*. n.126.p.638.

Joh. Pechlinius *M. D. de Aeris & Alimenti defectu, & Vita ſub Aquis*, 127.675.

Henr. Van Roonhuyſe *Obſerv. Chirurgical, with extraordinary Caſes of Women in Travel, Engliſhed*, 125. 621.

Joh. Raei *Clavis Philoſ. naturalis Ariſtotelica Carteſiana. Edit. ſecunda, aucta*, 131.790.

Mr. Sammes, *Britannia Antiqua illuſtrata*, 124.596.

Dr. Sydenham, *circa Morborum acutorum hiſtoriam & curationem*, 123. 568.

Monſ. Taverniers *Account of his Voyages over the moſt conſiderable parts of* Aſia, 129.711, *and* 130.751.

Georg. Velſchii *Centuriæ duæ Obſervat. Medico-phyſicarum*, 127. 673.

Vinetum Britannicum: *How to make many excellent ſorts of Wines of Engliſh growth by* J.W. *gent.* 123.574. *With an advertiſement to encourage the ſame*, 124.583.

Dr. Wallis; *Archimedes Arenarius cum Notis & Verſione*, 123.567.

C

CHina; *a paſſage to* China *by land from* Muſcovia *on the North-ſide of* Tartaria Magna, 130. 756.

Cabinets *and Repoſitories: of the G.* Mogol, n. 130. p. 754, 755: *of the King of* Perſia, ib. p. 757; *of the G. Duke of* Tuſcany, ibid. *of a Throne of* Unicorns *horns in* Denmark, ib. p. 768; *of a* Jaſpis *in* Vienna, 9 *foot diameter*, ibid. *of rare Manuſcripts*, ibid. *The Elect. of* Saxonies *Repoſitory furniſht with very many conſiderable rarities both of Nature and Art*, n. 130. p. 786.

Commodities, *very excellent in* Sicily, 127. 672. *and Phyſico-Medical rarities*, ibid.

Commodities *of the* Mogol *and* Perſia, n. 130. p. 754.

FIres, *how to be quenched by a* Parisian *Water-Engin*, n.128.p.679. *The Subterraneous* Fire, *and its productions in the Coal-mines near* Newcastle, 130.762.

Fishes, *in* Virginia, 126. 614. *A strange Man-fish there seen*, 625.

L

LIfe: *Human life extended long under water*, n.127 p.675.

Light: *Mr.* Newton *defends his doctrine of Light and Colours*, 123.556. *in answer to Mr.* Linus's *Objections*, n 121.p.459. *Mr.* Linus *against Mr.* Newton's *theory*, 128. 692. *Mr.* Newton's *defence*, ib.p.698 *and against Mr.* Lucas's *Light from Dead flesh, and transmitted meerly by contact*, 125.599. *Light returned for a while in a Factitious stone*, 131.788.

Lake: *Mexico-L. very strange*, 758.

Musk, *whence*, 130.756. *Musky scent in the Musk-quash*, 127.653.

M

MAgnetism: *Its force alter'd by great claps of Thunder and Lightning*, n.127 p.648. *Of Magnetism, See Mr.* Boyle *of* Qualities, &c.

Medico-Chirurgical *Observations: In* Virginia, 126.629. *In* Persia, 129. 712: *Wounds there cured with boyled flesh, or with hot fat, best of Horse-flesh*, ib. p.713. Persians *very healthful by drinking a decoction of* China-wood, *and they know nothing of the Stone or Gout*, ibid. *The Preparation of the* Helmontian ludus, 127. 742. *The Oyl drawn of Black flints, cures the Stone in the Bladder*, ibid. *The Spirit of* Spanish *salt potent against the Strangury*, ib *Hemlock with Sugar allays the heat of the Liver*, ibid. Trifolium paludtre *cures the Gout*, 743.

N

NAtural History *collected*, n.123. p.551. *A Fish resembling a man*, ib.p.625 *From* Dublin, 127. 647. *and* 129. 715.

Nutmeg, *planted by Birds eating them*, 130.754.

P

PHysick *and Chirurgery how practiced in* Persia, n. 129. p.712, 703. *in* Virginia 126.629, 630.

Plants, 127 672. *In* Virginia, *and how Tobacco planted and order'd there*, 126. 628 *Plants and Commodities in* Sicily, 127.672. *In* Persia, *how Palm-trees are propagated*, 129. 714. *In the* Mogol, 130.754. *That Nutmegs are planted only by Birds dunging*, ib. *Cinamon-trees sent out of* Ceylon, *in chests filled with the Native earth, thrive well in* Holland, 129.743. *Rock-plants: Mr.* J. Beaumont *proveth, that Plants, Fishes, Shells, and figures of Animals are found growing in the Rocks and clefts of Rocks in* Mendip-*mines, not brought thither and so petrified there*, 129.724, *and* 737, 738. *Gunpowder made of the Salt of* Centaurium minus; *but stronger Gunpowder prepared out of the Salt of another Vegetable not named*, 127.673. *A Gangrenizing and infectious Rye at some seasons in some places of* France, 130.758. *The powder of the* Mogullian *Indigo pierces incredibly*, ib. p.754. *The* Mogullian *Sugar being kept* 30 *years, becomes poyson*, ibid. *The fruit of* Solanum Vesicarium *suddenly changeth taste from sweet to bitter*, 127.673. *The juice of Vines frozen and representing the figures of V. and Grapes*, 129.743. *The like figurat. in Snow*, ib. p. 739 *The Text. of Trees accurately anatomiz'd*, 127.696.

S

STones, *bred in many Horses as well as in men, and the Bezoar-like vertue of those Stones*, n.129 p.743.

T

TRavels *from* Venice *through* Dalmatia, *and* Greece, *and M.* Vernons *Account*, 124 575.

W

WAter-Engin *to quench Fires, from* Paris, 128.679.

World: *The figure of the grand system of the World represented by the superficies of Fluids, and by liquors contiguous*, 131.775, *and* 132.799.

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